Digitized by the Internet Archive
in 2012 with funding from
Federally funded with LSTA funds through the Massachusetts Board of Library Commissioners

http://archive.org/details/transactionsofma1896mass

TRANSACTIONS

OF THE

Massachusetts Horticultural Society,

FOR THE YEAR 1896.

PART I.

BOSTON:
PRINTED FOR THE SOCIETY.
1896.

☞ SEE LAST PAGE OF COVER.

TRANSACTIONS

OF THE

Massachusetts Horticultural Society,

FOR THE YEAR 1896.

PART I.

BOSTON:
PRINTED FOR THE SOCIETY.
1896.

The following papers and discussions have been circulated to some extent in the form of slips reprinted from the reports made by the Secretary of the Society in the "Boston Transcript." As here presented, the papers are printed in full, and the discussions are not only much fuller than in the weekly reports, but, where it appeared necessary, have been carefully revised by the speakers.

The Committee on Publication and Discussion take this opportunity to repeat what they have before stated, that the Society is not to be held responsible for the certainty of the statements, the correctness of the opinions, or the accuracy of the nomenclature in the papers and discussions now or heretofore published, all of which must rest on the credit or judgment of the respective writers or speakers, the Society undertaking only to present these papers and discussions, or the substance of them, correctly.

J. D. W. French,
C. Minot Weld,
B. M. Watson,
Committee on Publication and Discussion.

TRANSACTIONS

OF THE

Massachusetts Horticultural Society.

BUSINESS MEETING.

SATURDAY, January 4, 1896.

A duly notified stated meeting of the Society was holden at eleven o'clock, the chair being taken by President NATHANIEL T. KIDDER.

This being the commencement of the term of office of the new board of officers and Committees, the retiring President, with appropriate remarks, introduced the President-elect, FRANCIS H. APPLETON, who delivered the usual inaugural address, as follows:

ADDRESS OF PRESIDENT APPLETON.

Fellow-Members of the Massachusetts Horticultural Society:

Twenty-five years ago this year I was sufficiently inoculated with the germ of fondness for, and in interest in, those branches of horticulture which are, in varied form, the charge and care of this Society under legislative assignment, to request that my name be presented for Life Membership, and I feel that had I been called upon to pay fifty dollars, instead of thirty dollars, for my Certificate it would not have been too much.

The possibilities for helpfulness to the individual who is interested in horticulture, and usefulness to horticulture in general, of this Society, are great — indeed much greater than is possible in this present building.

I feel that, in the several branches represented by our Committees, our Society can do more than is now possible, or is now our custom to do, to enlarge and advance the sphere of the

scientific and practical usefulness to, and the market possibilities for, our horticulturists.

Under the law, our property must be used strictly for the advancement of horticulture, and for that object must our income and real estate be directed. To that end are our special Committees on Plants, Flowers, Fruits, Vegetables, and Gardens chosen from those of our members who are best able to conduct such duties; and so are the members of the other Committees chosen for their fitness to carefully conduct the duties assigned to them.

Each Committee is wisely limited in the scope of its duties, and it is to them, in their several lines, that the Society must look for suggestions as to improvement, which must be subject to review from a financial standpoint. Income is always limited.

I believe, under like reasoning, that the interests of every member of the Society would be promoted by having the Real Estate and other invested property of the Society placed in the hands of a carefully constituted Board of Trustees.

After my twenty-five years of membership, somewhat actively passed upon several of our Committees, and after a quite general interchange of opinions among our members, I feel convinced of the value to horticultural interests in the State of the adoption of the foregoing proposed plan.

I venture to express the hope that you will be prepared to favor such a proposition, if it shall be presented to you later in wise form.

As proof of the indirect benefits from our work in various ways let me relate the following :

Not very long ago I visited certain Rose houses in the neighborhood of Boston, which covered several acres with glass, and whence I had known that all the product of roses had been shipped to New York. I asked the superintendent if New York continued to be their market. "Oh, no," said he; "all our roses now find ready sale in Boston." And I learned that, in his opinion, the Exhibitions of our Horticultural Society had accomplished so much towards building up in Boston an increased taste, and increased demand, for well-grown flowers, that the change of market had been thus brought about.

Look over the list of our members, and you find but few who have not contributed somewhat to horticultural work.

It is to this Society's encouragement, and to the work of its members, that our citizens are largely indebted for the beautiful suburban landscape that is made up of the homes of our wealthy and prosperous people. That encouragement and good work extends beyond the limits of Boston's suburbs.

The horticultural work undertaken by our municipalities throughout our State has also been stimulated and advanced by the example set by distinguished members of our Society, and others like them, whose beautiful grounds stand as object lessons in all branches of such work.

To show how horticultural tastes may be promoted, pardon my being a bit personal. My early days were passed in the city of Salem, where a home was incomplete without such a surrounding garden as the experience of most of you can readily picture, with its fruits and flowers, paths and hedges; and there a phase of horticultural liking was promoted.

Later, a change of home to the neighboring country gave fields and pastures, with natural growths of trees, shrubs, and native flora, with all the living accompaniments that interest, and benefit or torment; all of which gave opportunity that has developed another phase of horticultural taste.

With such varied surroundings, could tastes, other than those that are framed with horticultural likings, be expected, even though they are moderate in degree.

Thus are individuals encouraged, in part, to aid in advancing the work that our Society promotes.

How can any one, living in these days and knowing of the incorporated "Board of Trustees of Public Reservations," with their right to hold any land within the limits of, and in trust for, the State; also any one having a knowledge of the Metropolitan Park Commission, with its right to take and hold lands within that territory, whose life comes from the profits of business transactions largely consummated in that section of Metropolitan Boston which can be called "the City," and any one having a knowledge of the Boston Park Commission, which has constructed and developed a system of connected Public Park lands, from which the Metropolitan Park lands, and certain of the Public Reservations, are to become readily accessible, — how can any such person, if he has traveled, not agree that there is no city anywhere, especially on a seacoast, and on the banks of

two naturally beautiful rivers, with attractive streams and lakes, with hills and forests within and near her borders, that approaches the Boston of the near future in horticultural and landscape conditions?

The surroundings of these Parks offer limitless opportunities for landscape effect, and other horticultural work. The degree of beauty that shall result therefrom must be gauged by the skill and knowledge of those who have the moulding of such opportunities into realities.

Our lectures can in part be directed towards the preservation of high ideals in that direction, to good advantage.

Good taste in all our horticultural work should be encouraged, to prevent bad taste.

The market gardens in the neighborhood of this city, and elsewhere, whence we receive the fine specimens of produce that decorate our tables, are generally models of the application of science and business methods, to the work that is there conducted. Therein they set an example which our agriculturists can always adopt to their profit.

Business method means all possible economy; and application of science means prevention of waste, and increase of profit; all are essential to success whether in horticulture or farming. Herein is shown a field for usefulness of Experiment Stations and kindred establishments, but they will not always meet our needs unless our needs are made known to those who direct them, to guide their course of investigation.

The Winter Meeting of our State Board of Agriculture, and the numerous meetings that are conducted throughout the State with the Board's aid during the year, draw out the needs of agriculture, and attempt to meet them with wise advice.

As that State Board is constituted to perform educational work that shall benefit our horticultural and farming interests, it seems fitting that our Representative upon that Board should report on the beneficial work of said Board, as is done this year.

State and Nation are liberal to an extreme degree in our interest, and the money that is appropriated needs to be judiciously used and the results wisely disseminated in the cause of horticulture and farming to ensure its continuance to our stations and agricultural colleges.

This Society was organized March 17, 1829, and its Act of

Incorporation was signed by the Governor on the 12th of June. When its members assembled in the "Society's Room," which was termed convenient and spacious, over the counting-room of the "New England Farmer," at 52 North Market street, little did they dream that, sixty-seven years later, the same Society would be established here, as complete owner of this valuable location, which is almost surrounded by daylight. Nor did they suppose that this Society would exist to see the day when it had outgrown the arrangements which were made for it by their successors upon this site only thirty years ago.

We are probably all alive to our present deficiencies, but wisdom and good judgment have led your chosen officers to be cautious in studying our needs, and in advising plans for action.

When your officers are prepared to present plans to you for improvements in our Society's home that in their judgment will make the administration of the Society's chartered work easier and more effective, I bespeak for them your favorable consideration.

This city has made remarkable advances since this building was erected in 1865. The district devoted to business and trade has been greatly extended, and the centres of literary and social activity have greatly changed. The increase of population and valuation, the construction of our park systems, our improved methods of land transportation, and the spreading out of the people to whom Boston is their source of income, over an extended metropolitan area, make the conditions under which this Society is called on to do its work bear a changed and important proportion to the wonderful development of Boston.

From the Town of the days of the founders of this Society, with its cows pastured on the Common, and only two malls then constructed there, what advances have been made are evidenced by the beautiful trees that are growing upon that Common today, and the fact that our Common and its neighbor, the Public Garden, together, offer a problem to the landscape architect and engineer, upon the wise solution of which may depend the preservation of its beauty and usefulness to future generations. As an open-air space for the refreshment and promotion of the health of our citizens it must forever remain.

Something must soon be done to enable our Society to keep pace with the changed conditions that surround us.

Upon this valuable location, I have said, we have a building ill adapted to our needs. Our Exhibitions cannot be seen to good advantage on account of the necessarily crowded condition of what can be exhibited, in the lines of plants and flowers especially; and many of the larger plants that should be shown, could they be readily brought into position, *now* never reach our halls on account of, not only the great difficulty in carrying them into position up two flights of stairs (our elevator service being necessarily cramped), but also of the greater risk and probability of injury from having to carry many of them up in an inclined position.

Even in the case of the lighter exhibits, which can be easily carried to the tables, those who visit the show are too often inconvenienced, as is also the case with the plants and flowers, by the narrowness of the aisles. It is frequently the case that the usefulness of an exhibit is much lessened from the fact that there is insufficient room for the interested group to discuss it. Under such conditions today those visitors who have come to see and learn, but are not expert growers, meet with inconvenience and a degree of discouragement that is undesirable.

The accommodations for our volunteer Committees, upon whose careful decisions much always depends, could well be made better, and enable them to have improved opportunities to discuss the merits of the several exhibits before concluding their awards. Committee rooms are needed, and a room for the Treasurer and Superintendent of the Building is desirable. In such rooms the Executive, Finance, Library, and Lecture and Publication Committees would find convenient quarters for meetings that would relieve the Library, and be useful as anterooms when our halls were let for evening or other uses.

Such rooms should be under the control and assignment of the Superintendent of the Building.

With two flights of stairs for visitors to mount to enjoy more than half of our larger, beautiful Exhibitions, and a third flight to climb in order to secure one of those exquisite bird's-eye views, made more beautiful by the electric lights, in the Upper Hall, many would-be visitors are kept from our shows on account of age, or inability to mount our stairs. Our treasury suffers in

consequence of such inconvenience, and the cheering influence that might be imparted to many whose lives are confined to a city home is lost.

I would not call to your attention so publicly our deficiencies, as they appear to me, did I believe there was any chance of further detracting from the attendance in these quarters, but I consider that such detraction has been already discounted, and that the treasury has already suffered from these causes.

A most valuable asset towards promoting the objects for which we are a chartered institution is the Library. My intimate connection with this department, as a member of its Committee for a number of years, has enabled me to see that its value is great for our purpose; but the opportunities for using it and distributing its usefulness, bear too small a proportion to its value.

Its books are accumulating without shelf room to receive them, and are so filling up the floor and tables of the library and reading-room, and also the vacant space on the shelves behind the regularly shelved books, that the discouragements to use the library room are thus very great.

For some reason, not quite clear, the heating apparatus seems to be beyond control in the library rooms in the colder season, and the high temperature is complained of by members.

To accomplish the best results a reading-room should not be occupied by others than those having the delivery of its books in charge, while the reading-room and stack-room are combined, and be otherwise exclusively for readers. Where possible, a reading-room should be separate from the stack-room; but this is more than we should expect.

I feel that it is in the interest of advance in horticulture, so far as our Library can assist, that the minimum of work should be done in our reading-room, as at present constituted.

The shelves are now overflowing with books, and I will suggest that it may be a waste of money to attempt to improve the Library accommodation in this location.

To be of most use, our awards of prizes should be issued soon after the awards are made; and the effectiveness of the essays delivered is increased by early publication, when the Committee decide to print them.

Lists of Library acquisitions are always hung upon our walls, and they, with the corrected list of members, can well wait until

the Secretary can issue them, which is not always possible until after considerable correspondence. Our publications should not be delayed for these two latter. The Secretary is required to keep copies of correspondence, but the custom of copying by hand can well be replaced by the use of the letter-press, and meet the constitutional requirement. The adoption of the modern method of shorthand and typewriting, by an assistant, would seem to promote both correspondence and copying, and leave more time for other necessary work.

The Librarian controls the Library under the Library Committee, and all directions should go through him as to all Library matters, in the same manner as is the case of our Superintendent controlling the building under the Finance Committee.

I believe that a system of Bulletins in place of our Transactions might be found more beneficial; and these could be placed upon our tables, or mailed to those who should have requested that such be done. There would then be no unreasonable delay in having useful information reach our horticulturists in good season.

I ask the Committee on that subject to consider even a further reduction of the number of lectures, if that will secure the presentation of all in better form for the printer, from a financial standpoint. It has been suggested to me that semi-monthly lectures might be desirable. I consider that the Committee have full power to establish the number of lectures, and publish such as they may select, whether they shall be issued in Bulletin form or in the present form of Transactions.

I believe that it has been in past years a custom with the Society to offer prizes for Essays upon subjects to be given by the Committee, and such a method is named in our Constitution. A change to that form of securing lectures might prove of value, by promoting increased interest.

I submit these thoughts for consideration by the appropriate Committee.

The safety of our Library now lies in insurance, and not in the building which houses it. No library of such value as ours now possesses, could have been deemed possible when this building was erected; if it had, the library room would probably have been constructed in 1865 in a manner different from a purely commercial building.

It is supposed that the contents of a purely commercial building can be replaced in case of loss with the money received from insurance. But such is not possible with many of the books in a valuable library such as is ours, which ranks very high, if not first of its kind.

We are dependent for rental, above our first story, in this valuable location, from our halls when they are not required for our regular exhibitions or lectures.

In these we are greatly handicapped for two chief reasons. First of these is, that we have not suitable toilet and dressing rooms to make the halls as desirable as they should be for the best-paying uses, or, indeed, for any demands such as are in keeping with modern requirements.

Second of these is, that by reserving our lower hall for our lectures on Saturdays, in January, February, and March, it is impossible to accommodate a certain class of applicants for its use, whose best receipts come by renting for a complete week, especially in the middle of the winter season.

I present this phase to show that the ownership of so much space devoted to halls, such as are ours in this location, is unwise, with the adaptability to our needs so poor.

During the past and previous years, several plans have been considered by your chosen Committee, which were presented to them with a view to improving the accommodations for our chartered work, and which were estimated to yield fair revenue to promote that work.

The alteration of the present building has been considered, but it appears that such action can only change the conditions, and better them but little, if at all. If changes are to be made, they should include radical and advanced improvements.

A leading firm of architects, and a competent real-estate firm, upon request, freely submitted a plan for an entirely new fireproof building upon this site, of the extreme height allowed by law, which would reserve the two upper stories for one hall (for all but our largest exhibitions), a two-story library and reading-room, with committee rooms separated by folding doors which would allow of their being thrown into one; and afford other needed accommodations. The financial showing upon this plan appeared quite favorable to the Society when made. The balance

of the building was planned to contain rentable stores and offices, with good elevators.

Such a plan contemplated hiring a larger hall, or erecting a large tent, in the warmer season, for the larger exhibitions. It has been suggested that an exhibition in such a tent at Franklin Park, or in one of the new buildings being erected there, might be wise, if well advertised.

Another firm of architects submitted a sketch for a building suited to a new, proposed site, if our present property could, in the opinion of our Committee, be sold advantageously, and a wise purchase of land could be made elsewhere. Several locations were suggested, and considered in this connection.

Conferences were also held with leading city officials, to ascertain whether it was likely that the city would favor this Society in selecting a new site in connection with the Park systems, or elsewhere, in view of the importance of its work to public interest. There are possibilities in this direction.

I am told that in Philadelphia a new and ample Horticultural Hall, and anterooms, is either planned, or completed, that is handsome and convenient for its exhibitions, and for large assemblies. This is located in the heart of the city, and readily accessible by street-cars, carriages, or on foot.

I have deemed it wise to present to you these facts and suggestions in advance of that time (soon, I hope) when your Committee will find it wise to present to you recommendations. It is fair that you should not be led by the idea that your Committee has been inactive, for the members who compose it have been mindful of the Society's interests and chartered duties.

The subject is still under consideration, and your Committee can be trusted to act with wisdom and with discretion.

Before concluding with a summary of suggestions, in brief, I wish to commend the volunteer work in the promotion of our duties by so many of our members. It is by no means only those who so freely give of their time to act for the Society, so usefully, in this building, and who deserve much credit for assisting in making our meetings possible; but also the many other members, who constitute our useful and reserve force, who, at their homes and by their influence, contribute largely to make the Society's influence felt for good.

I would commend the subject of useful and injurious birds, useful and injurious insects, the value of water in connection with the fertility of our soils, the general subject of Botany, the usefulness of books on these subjects in our schools as cultivating the powers of observation, and the value of appropriately planted school yards, and home windows — all these, as worthy of promotion by the Society.

All these subjects are greatly promoted by volunteer work.

It is wise to make known to our members, and the public, methods to prevent the spread of all injurious pests, and which will cause their destruction, so that such injuries shall not be allowed to multiply to such an extent as to become in any case public nuisances.

Intelligence of the individual should prevent the necessity of calling for Government aid, by not allowing extreme cases to exist.

Our Experiment Stations are established to help in this direction, and are now well equipped. They have issued carefully prepared Bulletins for this purpose, and it is extraordinary how little heed is too often paid to the valuable advice contained therein. Even this city has not been exempt from this criticism lately.

Let us remember the true motto, that prevention is always better than cure.

Should it be decided to sell our building, we should endeavor to secure as convenient a location as possible, that we can grow up to, and where our hall shall be made accessible for the largest plants possible of exhibition, with convenient anterooms for our purpose, with fire-proof, and suitable, enclosure for, and that shall encourage the use of, our valuable library.

If we cannot soon find a way to wisely change, or radically improve, these quarters, I would advise a careful consideration of the removal of our library to a safe place of storage until accommodations are constructed in which it will be reasonably protected from fire.

The use of modern methods and conveniences in the conduct of our work, that shall make its usefulness effective, without unnecessary delay, should be adopted when such can be reasonably done.

A high standard in our lecture courses, with fewer lectures, if

deemed wise, which will guide us to advanced horticulture, are better than more lectures too hastily constructed.

If subjects which will be of most benefit to our horticulturists are selected early and submitted for the careful study of those who are at work for us in our Experiment Stations, combining science with practice, I am sure their professors will be glad to use our platform to make known their conclusions, and to meet our horticulturists in a mutual exchange of opinions afterwards.

I am sure that your officers and committees are all most sincerely interested to promote our work in a way that will be most effective; but I know that they are hampered by the conditions that now surround them.

If I have appeared to have spoken at too great length, and to have spoken too frankly to the minds of any, I assure you that it is only with a view towards the best interests of what we are all here to work for.

The address was received with applause, and on motion of Ex-President William H. Spooner it was voted that the President be requested to furnish a copy for publication.

The following appropriations, recommended by the Executive Committee on Saturday, the 2d of November, 1895, came up for final action and were unanimously voted, viz.:

For Prizes and Gratuities:

For Plants	$2,000
For Flowers	2,600
For Fruits	1,800
For Vegetables	1,150
For Gardens	500
Total for Prizes and Gratuities for the year 1896	$8,050
For the Committee on Lectures and Publication, this sum to include the income of $50 from the John Lewis Russell Fund	300

The Executive Committee further recommended the following appropriations, which were also unanimously voted, viz.:

For the salaries of the Secretary and Librarian, and the Treasurer and Superintendent of the Building	$3,000
For the Committee of Arrangements, this sum to cover all extraordinary expenses of said Committee	400

For the Library Committee, for the purchase of magazines and newspapers, binding of books, and incidental expenses of the Committee	$400
For the same Committee, to continue the Card Catalogue of Plates	100
For the Committee on School Gardens and Children's Herbariums, this sum to cover all incidental expenses of the Committee, and to be paid through the usual channels	250

The Executive Committee also reported the appointment of Charles E. Richardson to be Treasurer and Superintendent of the Building, and Robert Manning to be Secretary and Librarian for the year 1896.

J. D. W. French, Chairman of the Commitee on Lectures and Discussions, announced the Programme for the present year, the course to begin on the next Saturday, when E. O. Orpet, of South Lancaster, would read a paper on Hardy Garden Plants, which all were freely and cordially invited to attend.

Robert Manning read his Annual Report as Secretary and Librarian.

Charles N. Brackett, Chairman of the Committee on Vegetables, read the Annual Report of that Committee.

Henry L. Clapp, of the Committee on School Gardens and Children's Herbariums, read the Annual Report of that Committee. A supplementary report was postponed to the next meeting.

These three reports were severally accepted, and referred to the Committee on Publication.

A vote of thanks to Waldo O. Ross for his gift to the Library of forty-seven volumes of "Nature" was unanimously passed.

Benjamin M. Watson moved the appointment of a committee to confer with the retiring President in regard to adding his portrait to the series of portraits of the Presidents of the Society. The motion was carried, and the Chair appointed as that Committee, Mr. Watson, Desmond Fitzgerald, and C. Minot Weld.

J. D. W. French made the following motion: That the Committee on Finance, in consultation with the Committee on the

Library, be authorized to make arrangements for the storage of a portion of the books in some fire-proof building, to relieve the present crowded condition of the shelves. This motion was carried.

On motion of M. H. Norton the thanks of the Society were unanimously presented to the retiring President for the able and impartial manner in which he had performed the duties of his office for the last three years.

A letter was read from Hollis Webster, Secretary of the Boston Mycological Club, expressing the thanks of the Club for the courtesy shown them by the Society, and hearty thanks for the generous hospitality extended.

C. H. Tenney, of Methuen, and
William Donald, of West Roxbury,

having been recommended by the Executive Committee for membership in the Society, were on ballot duly elected.

Adjourned to Saturday, February 1.

MEETING FOR LECTURE AND DISCUSSION.

Saturday, January 11, 1896.

A meeting for Lecture and Discussion was holden today at eleven o'clock, the President, Francis H. Appleton, in the chair.

The following paper was read by the author:

Hardy Garden Plants.

By E. O. Orpet, of South Lancaster.

There is perhaps no need for one to apologize for appearing before a Massachusetts audience on the subject of this paper, for there is probably no other section of the United States where this class of plants is so largely used and appreciated for decorative gardening. Our latitude is well adapted to their culture, owing to the heavy falls, during our average winter, of snow, which is the best of all protecting mediums, and to our summers not being so hot or so dry as in some other parts of the country. We have a climate adapted to grow plants that come from almost all parts of the world, and the possibilities of the hardy flower garden are as great as those of any other branch of Horticulture,

if well studied and the wants of the plants supplied with intelligence.

To begin at the root of the matter, as it were, one thing has often struck me as being absolutely necessary to success, and that is a good preparation for the purpose intended. If one intends to plant a tree it is generally conceded that the operation should be the event of that tree's history in that garden. Whether it be for beauty or utility, there should be careful preparation of the soil, and even more careful choice of situation, since there is to be no more change once the tree is in place. The making of a border for hardy herbaceous and bulbous plants is likewise a permanent matter, for most of these never succeed so well as when left alone and allowed to get deep foothold in the place assigned to them. Changes of a minor nature there must be in the natural order of things, but these can be made without an undue upheaval, for it will take a year or two for a complete recovery to vigor and profuse bloom.

To secure the best results a soil of good depth, with a good supply of natural moisture, and free from the influence of large tree roots is the ideal position for the cultivation of these plants, and, given these conditions, there are unlimited possibilities, and a place where flowers can be gathered from April to November. The soil ought to be dug for at least two feet in depth and made rich at starting, for it is well to keep in mind at all times that a border of this kind should never be dug with spade or fork after being once planted, for, given all the knowledge that pertains to the subject and all possible skill with the implement, it is not possible to dig in among plants of this nature without injuring more or less of them, and this again emphasizes the need of a good preparation beforehand. If it is desired, after the lapse of years, to fertilize to keep up the necessary vitality, it can always be done in the way of top-dressings in autumn, after the advent of cold sufficient to make all dormant for the winter. These top-dressings should consist of well-decayed material that will be easily assimilated by the plants in the spring, and the luxuriance of the returning foliage will cover the whole so that there will be no objectionable appearance in the beds.

It is not my intention to give a list of plants that are suited to this kind of gardening; these can be had from any good catalogue, and their habit and time of bloom also; but it has seemed

to me well to note some that are not specially desirable in a general way. We hear too little of failures; people do not always care to chronicle them, but it is a pity, for much can be learned from them. Some plants seem to have the ability to appropriate a good deal more than consists with the well-being of others surrounding them. Such is the case with *Achillea serrata*, sometimes also called The Pearl, for, given a small plant to start with in the spring, it will by fall have taken to itself a square yard of soil area, and is, besides, a most difficult thing to dig out of other plants. The smooth-leaved Sunflower, *Helianthus lævis*, I have been trying to eradicate for five years in our own borders, but we seem to be as far away from the desired end as ever. It is a decidedly decorative subject in its season, but as it flowers when so many similar plants are in bloom, it is almost impossible to avoid some that are in bloom, and a crop of seed is matured that will make its perpetuity sure. The pretty *Anemone Pennsylvanica* I have also begun to think is impossible to get rid of, for the more one digs the more it spreads. The variegated form of *Ægopodium Podagraria*, the Bishop weed, is sometimes offered in lists, but a more troublesome weed does not exist; it has cost thousands of dollars to dig it out in Central Park, New York, and when visiting the famous gardens at Belvoir Castle last summer, the gardener told me that ever since he took charge he had kept two men doing little else than digging out this weed. And so this list might be added to, and made much longer; but the moral is, a place for everything, and everything in its place. If such subjects were rigidly kept in the wild garden we should hear less complaint as to the ragged appearance of this class of plants, and there would be much less misery for the cultivator. Even among what are undoubtedly regarded as desirable subjects for all borders, there are many that are too apt to increase at the expense of those with less vigor, and these must be checked at all times if the desired harmony is to be maintained.

In our case we like to plant thickly at the outset, using plenty of the sorts easily raised from seed, to cover the space quickly, and thin these out as the better plants take hold, and gradually work out the desired effect. We have also found that in various situations, plants behave differently, each locality suiting some one or other better than we knew, and these have to be lifted and replaced in a more fitting position to preserve the balance of

the whole. This, as indeed all planting of hardy plants, is best done early in the fall, about the time the heavy rains begin; the earth has not then lost its warmth, moisture is present to enable the young roots to take hold quickly, and in most cases there will be no reason the next year to suppose any change has been made as far as the health of the plant is concerned. Spring planting is unwise in many ways, always supposing one has the other alternative; we all have enough to do in spring, dealers included, and I have invariably found that we could procure better stock in fall than in spring, and could rely on getting it in a condition fit to plant, whereas in the spring, in sending to a distance, perhaps we get plants that have been in the best condition to plant a month before our ground was free from frost. It is at all times desirable to get all the work done that we can in the fall, to avoid the spring pressure at home.

Lilies should most surely be planted in the autumn, and also Narcissuses and other bulbs. It does seem sometimes that Lilies are not appreciated as they deserve in our outdoor effects. At Kew last summer I was impressed with the freedom with which they were planted, not alone in their natural order, but among beds of low-growing shrubs and evergreens, especially Rhododendrons. The effect was very beautiful at the time of my visit, and would be for the greater part of the summer, as the various species came into bloom. We can grow these beautiful plants here with as great or greater success Japan Lilies are well adapted to our climate here in the Eastern States, and with few exceptions are permanent garden plants. This is easily explained by the fact that our territory east of the Alleghanies is identical in extent and latitude with that of Japan the climate also being very similar, having the same extremes of heat and cold, so that plants from the East thrive here much better than in Europe. To illustrate, I was much surprised to see at Kew last summer large numbers of *Hydrangea paniculata* grown in pots in the greenhouses, and, on asking the reason, was told that they could not flower them unless the growth was ripened up indoors. We ought to see more Lilies planted here in gardens; they are impatient of a dry soil in summer, or of one in which moisture is superabundant in winter, but in ordinary garden soil they thrive with great success. The best of all positions is among the Rhododendrons, and here we can have a succession

that come on one after another until September frosts. The shade afforded by the Rhododendrons gives a cool soil at all times, and a slight protection from late spring frosts to the young shoots, and in fall the leaves placed about the roots of the Rhododendrons give a sure and safe guard against severe cold, and also keep the bulbs from starting prematurely. There was a time when it was regarded as an astonishing feat to flower *Lilium giganteum* in the outdoor garden, but in such a position as that named, there is no difficulty in not only flowering it for one season, but in growing and increasing the plants indefinitely, and when well grown and flowered, there is no other Lily, and very few hardy plants, that can approach it in its majestic vigor. I have seen the flower stems over ten feet high in the garden of Hon. John Simpkins, at Yarmouthport; his were strong, well-established clumps, and perhaps the finest ever seen in cultivation. There is no reason why this Lily cannot be grown in any garden, but care must be taken in procuring bulbs that are true to name. We have been sadly mistaken once in being supplied with bulbs of *L. cordifolium* for the true *L. giganteum*. There is also another Himalayan lily of tested hardiness here in Massachusetts; I refer to *L. sulphureum*, or *Wallichianum superbum* as it is more often called, though not so correctly. This is one of the most lovely lilies there are, and the specific name "sulphureum" aptly describes the soft yellow interior of the large flowers. Although it comes from the Himalayas, it is as hardy as *L. tigrinum*, and, like the old Tiger Lily, produces little bulbs from the base of each leaf. We have about three dozen nice young bulbs, almost as large as a hen's egg, these being only a year old, and most of them will flower next summer if permitted. This lily used to be rare and costly, but it has recently been propagated in this country to a large extent, and will soon be as cheap as other varieties.

It seems to me that we have too often been inclined to consider these and other plants tender, and coddle them in the greenhouse for no other reason than that they come from the East Indies, forgetting all the time that it is not merely latitude or longitude that concerns us as cultivators, but altitude. If we give but a moment's thought it is reasonable enough; we get Orchids from directly under the Equator that require the coolest possible treatment in greenhouses, and no doubt there are plenty

of plants there also that are hardy enough here outdoors, and a reading of the account of Whymper's ascent of Chimborazo makes one wonder all the more that they have not been seen in cultivation.

While on the subject of lilies, there is one from Central China that will be a decided gain to our gardens when it is more plentiful. I refer to *L. Henryi*, which, as seen at Kew last season, is most distinct, vigorous, and free-flowering. I saw plants that were eight feet high, and bore over thirty of the uniform apricot yellow blooms to a stem; this may not be the maximum number, but it has been attained gradually; each year more strength has brought more bloom and no signs of deterioration have been apparent, and there is every reason to believe that it is as good as it is beautiful. *L. auratum platyphyllum* is another good garden lily that is not common; it seems to be a well-marked form of *L. auratum*, with very broad foliage — as broad as that of *L. speciosum*, and like that species, it will thrive indefinitely in the border, the bloom being almost identical with that of *L. auratum*. The Japanese seem now to appreciate that these rare forms are worth cultivating for export, and we can now obtain them at a very reasonable rate. *L. auratum platyphyllum*, or, as it is often called, *L. auratum macranthum*, is one of the finest lilies for the garden, and indeed has been called the "King of all Lilies."

No garden seems to be complete in the early spring months without a selection of Narcissuses, and, taking the best of these, there are few more reliable bulbs for garden use. Of recent years there has been a revival in Narcissus culture that has amounted to a craze, and it has resulted in the production of garden hybrids and forms innumerable. Collectors have also been sent through Southern Europe in search of those that are less known. These two facts need emphasis, for they are fraught with considerable meaning to American cultivators of the Narcissus. We have during recent years made an extensive trial of most of these new introductions, especially those of Spanish origin, and we find that after flowering the first year they dwindle away and rarely succeed in gardens; indeed, of the many that we have had, such as Johnsonii, Queen of Spain, Saragossa, Santa Maria, King Humbert, Pelayo, and others, it is safe to say that not one bulb remains; but though we have not the bulbs, we have the knowledge, and this was the primary reason why they

were planted — to find out which were reliable and most desirable. On the contrary, taking those of hybrid or garden origin, there are few indeed that will fail in American gardens, and by a fortunate coincidence these are by far the best Daffodils. There are raisers today who cultivate and hybridize Narcissuses as carefully as the raisers of hybrid Orchids, the pedigree is as carefully recorded, and all pains taken to improve the race. The reason is simple enough, for there is very little credit or profit in giving to the world such as are not of easy propagation and of vigorous constitution. If they lack these two requisites, we never see them disseminated, and we conclude that all Narcissuses of garden origin are vigorous. There is a phase of Narcissus culture that is too rarely seen in American gardens, and that is naturalized among grass in semi-wild or shady places. The Poet's Narcissus, and the numerous forms that have allegiance to it, all the *incomparabilis* section, and in fact all that have flowers of starry outline, look best and thrive well when planted among grass that is not too rank-growing; and even if this has to be cut off about midsummer, at haying time, the foliage will be ripening off then, and no injury will result from cutting off the tops at that time. There is also less liability to decay from the dreaded base rot than when cultivated in rich soil in borders, though I am inclined to believe that we shall never have so much trouble from this source as is experienced in European gardens. We have never had an authentic case of it in our garden; what was feared at one time to be a case, was simply the deterioration before-mentioned of kinds that were unfitted to the climate.

For cutting for indoor decoration there are few to excel such as Empress, Horsfieldii, Michael Foster, and William Wilks, all of which are bicolors and bloom in succession. Countess of Annesley, Emperor, Sir Watkin, Princeps, and Golden Spur are all of the larger-flowered yellow varieties, and to these may be added the *incomparabilis* and *Barrii* sections that are so plentiful in varieties, but prove to be well adapted to our climate. We have always preferred to keep these bulbs out of the mixed or herbaceous border proper, and keep them in a separate border, which in summer is planted with annuals for cutting purposes; these shade the soil from the burning sun in summer and give also a double crop, as it were, from the same piece of ground. The

Narcissuses are planted in rows sixteen inches apart, and the annuals, such as Stocks, Asters, Mignonette, and like subjects, are set out between each row, and these are gay in late summer and autumn. When these annuals are cleared off after frost, a top-dressing is given all over the beds, and this is all the fertilizer they seem to require. The Narcissus will not thrive indefinitely in the same spot with the same vigor as when lifted every three years and sorted in sizes, replanting them after the soil has been enriched to a good depth. The best time to lift is at the dying off of the foliage; the roots are then found to have died off too, except in the *Poeticus* section, which seem never to be wholly inactive. It is, of course, quite in keeping with a herbaceous border to have clumps of Narcissus mixed in here and there along the margin, and where but few are grown, this is, perhaps, the most desirable way, but where there is a collection of many varieties, it is preferable to have them where labels will not be disturbed and where each kind is near the other for comparison.

I am anxious to say a word or two in favor of the various Tulips other than those generally used for massing for color effects. There are a number of genuine species of Tulips that are most beautiful in the mixed border, and they have also greater vigor and taller habit, and grow on for any number of years without deterioration. *Tulipa Gesneriana* may be taken as the type of these late-flowering kinds, and there are few bulbs that give such rich coloring as this; it is rich without being gaudy. Then there is the Horned Tulip, *T. cornuta*, with petals that narrow out to a point; *T. Greigi*, with its rich colors and prettily spotted leaves; *T. vitellina*, a pure yellow; and so we may go on to the number of fifty or more species that are not often seen cultivated, but some of which are real gems for the rock garden, being of dwarf habit and liable to be spattered by rain if planted on the level ground. You have no doubt heard of the so-called Darwin Tulips. This is only a new name for the old-time Breeder Tulips of the Flemish and English raisers; they were so called because from these were selected the kinds that were considered good enough for naming. The Tulip craze has mostly died out, but the lovely colors of this section give them a charm that is peculiar, and rarely tires; rich dark velvety colors predominate, yellows being absent; no two are alike if bought in mixture;

their stems are erect, stiff, and admirably adapted for cutting. With us they flower at the end of May, and we have found that they like a soil which is not liable to dry out, as the quality of the bloom suffers in dry soil. It is advisable to plant these tulips in small groups of six or eight, and it will be found that each year the quantity of bloom is about doubled from each clump and they are altogether most satisfactory.

Another beautiful hardy plant which is not common, but is perfectly reliable, is *Eremurus robustus*. I know of no other that will give the same effect except the Verbascums, and these are not really hardy. The *E. robustus* throws up a spike from five to six feet high, and for the greater part of its length covered with pale pink flowers which open in quick succession, so that the greater portion is in bloom at the same time. The foliage is prostrate or nearly so when full grown, and soon dies off after blooming, which it does at midsummer. It is one of the noblest of garden plants, so far as our experience goes — not easy to raise from seeds, for very little seed is matured, but once planted, there is no fear of losing it. There is another species, *E. Himalaicus*, which has grown well each year, and we hope to see it bloom this coming season. Mr. Veitch tells me that it is beautiful as seen growing in its home, and is the most beautiful of the genus. There are several other species, but we have no positive knowledge yet as to their hardiness. The place where they are planted should be well marked, or better still, group them together, as the foliage dies off soon after flowering, and some other plants of annual duration may be used to cover the ground.

It is not my province to speak of Annuals as a class at this time, but it is tolerably certain that we cannot do without them in the mixed herbaceous, or whatever other name is given to the border. There is sure to be a scarcity of bloom in July and August, if perennials are relied upon to give a continued effect, for there are so many and varied subjects used in this work, which start early and die off soon after bloom is past, as, for instance, the Oriental Poppies, Mertensia, all bulbs, and more that might be named. The gaps which they leave in the arrangement are not pleasing. It is an easy matter to dot in Zinnias, Asters, Stocks, or even taller-growing annuals, to make good the deficiency, and to give a greater profusion of bloom.

Another point worth naming in this connection is the desirability of having a permanent backing to the borders, if they are extensive, or especially if wide. Ours are twelve feet wide for most of their length, and give scope for the tallest plants there are; but to each border there is a single belt of either *Rosa Rugosa*, *Pyrus Japonica*, *Hydrangea paniculata*, or *Syringa* (Lilacs), each used separately, and this gives a stability to the effect that would not exist otherwise. In the early summer months before the tall Larkspurs, Sunflowers, Asters, and Boltonias get up high enough to serve as a background, we have these early flowering shrubs in bloom, and the effect is greatly enhanced. Another feature — perhaps the most striking of all — is when in late summer the long belt of hardy Hydrangeas is at its best. This is kept well pruned down, and the shoots are thinned out when they start, to give size to the panicles of bloom.

I suppose most of you have the *Dictamnus Fraxinella;* it is well known for its inflammable qualities, but it is not so well known for its poisonous properties. A neighbor last summer had severe eruptions on his arms, and the family physician, a man of long experience, could not diagnose the case, but before admitting this, he very nearly decided it was a case of small-pox, and it also transpired that this poisonous property was not accredited to the plant in his reference books. Being so common in gardens, and so frequently handled when in bloom, its most virulent period, it cannot be too well known that it is a dangerous thing to handle, as I found out years ago when saving and cleaning seeds.

To those who have the requisite location, there are few more interesting features of outdoor gardening than that styled the Rock Garden. I saw two of the best examples of artificial construction last summer that perhaps are to be seen, and it seemed to me that we might do more of it here. We are limited to a comparatively few plants in our climate; the exquisite Saxifrages of the European Alps, the Primulas, Androsaces, Ramondias, Cyclamens, and many of the plants they use abroad will not succeed here, and for that matter some of our choicest Rocky Mountain Alpines absolutely refuse to grow when brought from their high estate, but there are many that will succeed if given a little attention. A well-constructed garden of this sort has a most charming effect when the Moss Pinks, Columbines, and various spring-flowering bulbs are in bloom. It is at all times

advisable to see that the strong do not crowd out the weak, and in this kind of planting it is not possible to use the hoe, and seedlings are sure to appear in abundance, often to the exclusion of the choicest plants. This is true also of borders, and we find that in a short time the best Larkspurs and Phloxes seem to revert to original types, and Columbines hybridize out of recognition; but it is all explained by the fact that seedlings are too numerous, and, until they bloom, have much the same appearance. I am inclined to think the Aquilegias are not strictly perennial; they flower for a year or two, and then disappear. I think this is true also to some extent with all plants that have not a tuberous or bulbous root. We all know how difficult it is to keep the true Rocky Mountain Columbine, or the Siberian *Aquilegia glandulosa;* this all means that we must have a reserve border, where a few plants can be isolated for seed, and the seedlings grown on to fill up losses, or we can test some doubtful plant and propagate desirable ones. There are many reasons which make a place of this description desirable that will occur to all.

Most hardy plants are easily raised from seed, and a seedling plant that is healthy, even though it has never bloomed, is preferable in the long run to any other; there is no serious check in transplanting, neither has it been weakened by flowering. The best time to sow seed would be as soon as gathered; but we usually have too much hot weather at that time, and it is best to wait until a cooler time in fall. If there is a greenhouse at disposal, they can be sown at any time during winter; but I much prefer to get them large enough to be able to winter them over in cold frames, where they do not start much earlier than they would outdoors, and they can be placed in their permanent positions as soon as the ground permits. On the other hand, such as have been grown in the greenhouse need as careful hardening off as if not hardy, for they are made as tender as any plants by their treatment indoors. If any of the seeds fail to germinate, though they are known to be fresh, it is well to put them in a cold place where the soil can be frozen well for a week or two. This seems essential to success with some, such as *Aquilegia Stuarti, A. glandulosa,* Anthericums, Hellebores, Clematises, *Rosa rugosa,* and many others that would germinate a few at a time for years, but will come up simultaneously if the freezing

process is adopted, and herein is one of the main advantages of sowing early in the fall.

Discussion.

Mr. Orpet said that *Aster Novæ Angliæ* becomes a weed in the garden.

Professor B. M. Watson asked what success had been obtained with *Lilium auratum*. Mr. Orpet answered that it was impossible to make it grow more than two years, but as it is so cheap we cannot complain of the necessity of renewing it.

Nathaniel T. Kidder inquired about *Tulipa Greigi*. Mr. Orpet said he had grown it for five years, and considered it one of the best of spring plants.

In answer to several questions by F. L. Temple, Mr. Orpet replied that double Delphiniums, such as named French varieties, often die the first winter after importation, but seeds saved from these varieties and sown produce a large percentage of double forms, and these are good permanent garden plants. Aquilegias, too, often act in like manner, dying after the first flowering, and are best taken care of when seeds are saved from the best forms and species and sown each year. *Helenium autumnale* is desirable as a plant for the back border. He never knew the Oriental poppy to winter kill. Gaillardias, however, are hardy perennials which disappear after a short time. The double *Lychnis chalcedonica* is a grand plant to grow in masses. It has been thought to be new to cultivation, but was advertised in catalogues in 1832. He never knew it to grow four feet high; generally it is only two. As the double *L. chalcedonica* does not produce seeds, it must be propagated by means of the suckers made at the base of the old flower stems; these may easily be rooted, but should be wintered over in a cold frame until spring before planting out in the open ground. *Lychnis vespertina fl. pl.* is more beautiful and easier to propagate.

Mr. Temple stated that he had had a form of *Lychnis vespertina fl. pl.* that had flowers as large as a Carnation, and it was sent out as a new and beautiful form.

J. Woodward Manning said that the Double White and Double Scarlet *Lychnis chalcedonica* grow from three to three and one-half feet in America. He also spoke of the Gaillardias, which are true perennials in England, but have the unfortunate habit

of dying out in the centre of the crowns yearly, and for that reason are hardly to be depended upon in our climate.

Mr. Orpet said that Mr. Manning was perfectly correct in regards to Gaillardias, but thought they should be grown if they flower only one year. *Alstrœmeria aurea* is perfectly hardy, and becomes quite a weed in Rhododendron beds. *Lychnis Haageana* is a perennial which lasts for several years, and then dies out.

Mr. Temple wished to call attention to the practice of cutting back perennial border plants with a view to making a display late in the season, and Mr. Orpet stated that in one of the places he had had charge of, the family did not reside there until late in the season, and to produce a late display it was a regular practice to cut back Phloxes, Delphiniums, Heleniums, Silphiums, Asters, and all plants of like growth, so as to produce a late effect from plants that ordinarily would be past their prime.

M. H. Norton stated that by cutting back roses, and keeping the ground moist, they can be kept in bloom during the whole summer.

Mr. Kidder noted that herbaceous plants are comparatively free from insects. He spoke of a new and very destructive insect found on *Anemone Japonica,* and asked if others present knew it.

Mr. Orpet had seen the same insect on Baptisia, and expected to find it on everything next year. Rose-bugs go the whole round of the garden. As to alum dissolved in water, which had been recommended as a remedy for rose-bugs, an ounce to two gallons of water had proved ineffectual.

J. H. Bowditch asked about Aquilegias, which were raised from seed, and succeeded for a few years; then there seemed to be a borer which destroyed them. Mr. Orpet said that plants grow to an exceptionally vigorous state in gardens and are then more liable to rot. He never had much difficulty in transplanting Aquilegias, except *A. glandulosa;* it is very difficult to make this species live after removal. The best way is to raise from seed, and set out from pots; then they will live four or five years.

Professor Watson had found that hand picking is the only absolute remedy for the black beetle which eats *Anemone Japonica* and Clematises. This must be done early in the morning. Bordeaux mixture made very weak has proved successful.

Mr. Manning said that cut-worms and angle-worms enter into

the crowns of Aquilegias and Delphiniums, and do much damage, as also is the case with the wire-worm, to a certain extent.

Mr. Orpet agreed with Mr. Manning, and added that all our native species of Aquilegia are very beautiful, and should be raised from seed saved from plants growing in isolated places, owing to the facility with which the species hybridize. In speaking of so-called perennial plants, he said that they are not all strictly perennial naturally.

MEETING FOR LECTURE AND DISCUSSION.

SATURDAY, January 18, 1896.

A meeting for Lecture and Discussion was holden today at eleven o'clock, the President, FRANCIS H. APPLETON, in the chair.

The following lecture, provided by the Massachusetts Society for Promoting Agriculture, was delivered:

CONSERVATISM IN SCIENTIFIC AGRICULTURE.

By Professor W. H. JORDAN, Director of the Maine State College Agricultural Experiment Station, Orono, Maine.

The American Agricultural Experiment Station is this year twenty years old; the American College of Agriculture is older. During at least a quarter of a century the teacher and investigator, to a greater or less extent, have been active in this land of ours in their efforts to illuminate the business of the farmer with the beneficent light of Science.

Their success has not been startling, though great enough to justify the effort. Inexperience, imperfect knowledge, the immense labor of successful teaching and investigation, prejudice, the inertia that always attends any educational movement, all have conspired to render the attainment of the ultimate object, viz., a more rational practice of agriculture, slow and difficult.

From one point of view, however, a great deal has been accomplished. Generous endowments, both State and National, expended by a large body of trained workers, an enlightened thought, and an improved farm practice testify not only to past achievements but to present effort on a scale that is truly marvelous.

We may possibly gain courage for our work and faith that the future has its triumphs, and we shall certainly properly introduce our subject, if we gather up into a brief summary a statement of the resources that are now being applied along various lines, to the betterment of agriculture.

According to official statistics there were in 1894 sixty institutions in the United States maintaining courses in agriculture. The faculties of these institutions included one thousand six hundred and forty-three persons, who were using annually nearly four and a half millions of dollars in the instruction of over twenty-one thousand students, about one-fifth of whom are registered in the Course in Agriculture. In the same year the Experiment Stations numbered fifty-five, fifty-one of them receiving Government aid. These stations were officered by five hundred and seventy-seven persons, who were using annually in various ways nearly a million dollars. They published in the year mentioned fifty-four annual reports and four hundred and one bulletins, and distributed this literature to half a million persons who are either directly or indirectly interested in agricultural affairs.

It appears, then, that the time of perhaps two thousand persons,[1] and the outlay of five and one-half million of dollars, are annually being applied to education and investigation, largely that the farmer may know more and do better. It is worthy of remark in passing that of this large sum of money, over two and a quarter million dollars are a direct gift from the national Government. Not all of the expenditure for the maintenance of student instruction in the land-grant colleges is used in teaching agriculture, but a generous proportion is — much larger than is indicated by the percentage of agricultural students.

In addition to this national aid to agriculture, which surpasses that ever provided by any other nation, a majority of the States have established boards of agriculture and have arranged by law for the public instruction of farmers, either through what are called farmers' institutes or by means of migratory schools, such as the dairy schools of New York. We have no means of estimating the time and money thus utilized quite directly for the popular education of the agriculturist, but their amount is large.

This, then, is the situation: Agriculture along with other industries is recognized in our higher institutions of learning

[1] Some who are engaged in teaching are also station workers.

both by elaborate courses of study and by liberally endowed departments of investigation; a great mass of literature dealing with the scientific and semi-scientific phases of agriculture is being spread broadcast over the land; a small army of public teachers, both official and self-constituted, are addressing audiences of farmers from the platform, on every subject that has even a remote relation to farming, and the agricultural press, not to be outstripped in this onward march of new theories and modern methods, is active in reviewing Experiment Station literature and in presenting the views of a great variety of writers, including the scientist, the pseudo-scientist, and the so-called practical man. And so from all this probing for nature's secrets, this speaking and writing, this discussion of new theories and methods, some of which live but for a day, some of which become the vexed subjects of prolonged, earnest discussion, and some of which crystallize into practice, we have attained to an activity of thought, an elaborateness of treatment, and a complexity of detail concerning things agricultural, which present a marked contrast with the conditions that prevailed even twenty-five years ago.

There is at least one complaint the farmers of the United States no longer have the right to utter, which is, that they do not receive full recognition in the exercise of the paternal functions of the National and State governments, or in the growth of the means and methods of public education. Whatever may have been their motives, or the arguments which may have been so successfully used in influencing their action, the representatives of the people have, in their exercise of legislative authority, dealt fairly generously with the industry that feeds us all. Our government may reasonably claim to have done its part up to the present time in the efforts that are being made to impart special education and to discover needed truth.

The question which must come to the workers in College and Station with great force and meaning is: Are we justifying this great use of time and money by what we are accomplishing? Is this tremendous activity that we are putting forth being directed along the right channels? Are those who are teaching and investigating and who are speaking through the press or from the platform, fully recognizing the real needs of agriculture?

It has seemed to me that on this occasion, in the year which marks the twentieth anniversary of the establishment of the first American Experiment Station, it is entirely fitting to ask these questions, and to discuss our relation to their future satisfactory answer.

It is not my purpose at this time to attempt a statistical enumeration and discussion of our appliances for education and investigation, or to undertake a detailed criticism of the methods in vogue in the College and Experiment Station. I do propose, however, to call attention to certain general considerations which I believe should have a controlling influence in the development of class-room and popular instruction, and in the various lines of experiment and investigation.

The subject that is set for discussion is, Conservatism in Scientific Agriculture, which perhaps needs a preliminary definition as indicating the lines of thought which it is proposed to follow.

The conservatism for which I would contend is that which is induced by a recognition of three truths:

First. The proper cultivation of the man is fundamental to the safe development and right use of material resources.

Second. The education, that in agriculture is primarily important, proceeds from instruction in the relations of matter and energy and in the scientific facts and principles which enter into and environ life, rather than in imparting the technics and manual skill of the farm.

Third. Substantial progress in any art must be based upon an accurate knowledge of underlying truths.

Scientific Agriculture is commonly understood to be the practice of agriculture in accordance with the known facts and principles of science, but in our discussion today we will understand it to include as well the various organizations and activities that are auxiliary to agriculture as the means of rendering it more rational. Our subject involves, therefore:

(1.) The Experiment Station.
(2.) College and School Instruction.
(3.) The Farmers' Institute.
(4.) The Press.
(5.) The Farmer.

These I understand to be the various agencies through which an organized effort is being made to convey to agricultural practices the benefits of the exact knowledge we call Science.

We will first consider, then, scientific investigation as a factor of modern agriculture. This is certainly the logical order, for we must discover truth before we can teach it. What relation does our subject bear to the work of the Experiment Station?

There exist, I believe, substantial reasons for the following assertions:

(1.) Much of the experimental data and conclusions now being published by American Experiment Stations will not only fail to find a permanent and useful place in the records of scientific progress, but they have been so reached as to make error easily possible.

(2.) The greatest obstacle to progress, or even safe procedure, in the art of agriculture, now existing, is an insufficient knowledge of foundation facts and principles.

(3.) The two foregoing statements suggest the easy possibility of disappointment from any practice induced by Experiment Station influence when that practice rests as a superstructure upon unsafe or insufficient foundations.

I desire to enlarge at some length upon these statements in order that my meaning may be plain.

And I remark concerning the facts touched by the first statement that they are due in part to a cause which serves as a partial excuse for their existence.

There has existed a natural but unreasonable demand on the part of the public for immediate practical results from Experiment Station work, and so from reasons of policy some have felt it to be necessary to rapidly promulgate conclusions with regard to this or that point in agricultural practice.

In order to do this, experiments of a very practical character have been carried on — experiments, some of them, involving such large chances of error that safe conclusions were not possible. Many of the field tests of fertilizers, feeding experiments, and variety tests are of this class, and the records of them have already begun to find their way into that mass of rubbish which will remain forever buried.

A satisfactory control of such experiments, so that their

apparent outcome may represent the truth, is exceedingly difficult, and even under the best of conditions much repetition and care are necessary to prevent reaching erroneous conclusions.

The discovery and establishment of a truth is no commonplace task. It is not easy so to hedge about a new principle or fact with accurate data that it may be accepted with unreserved confidence, and it has often required years of enthusiastic devotion to scientific labor to accomplish this. These facts the unscientific mind does not apprehend, and so the public is inclined to expect Experiment Stations to reach safe results with the uniform certainty and regularity of a machine.

We are fully convinced that we should have less commercial work, less of the extremely practical experiments, and more of elaborate and severe scientific investigation, — at least there is need that there shall be less haste in the promulgation of conclusions because of a more rigid inquiry into the basis upon which they rest.

There is certainly one reason that every farmer ought to appreciate, why any conclusion which affects his business should be guaranteed by the most exacting inquiry, viz.: the business of agriculture cannot afford the delay or disaster which may result from wrong conclusions. Could we have afforded to adopt the Babcock Test as the basis of commercial dairy work had not the facts fundamental to its use been well established? Should it be proved that the diagnostic properties of tuberculin are not what a conservative opinion has claimed, — a result we do not fear, — would it not be properly regarded as a great disaster for such a mistake to have been made? We plead, therefore, for the conservatism of exact scientific methods in our Experiment Stations and for a patient confidence on the part of the public in what may appear to be slow progress in the solution of Nature's problems.

My second point touching Experiment Station work relates to the imperative need for a better knowledge of those fundamental facts and principles which we think of as belonging to pure science.

We are to some extent attempting to build a superstructure upon insufficient foundations. For instance, we are conducting feeding experiments with foods, the nature and function of whose constituents we do not fully understand, and consequently

we often lack the data necessary to a proper interpretation of results. Until we have a wider and more exact knowledge concerning the character and nutritive functions of the various compounds which we huddle together under the terms *protein* and *nitrogen-free extract*, we shall be handicapped in our attempts to solve problems in animal nutrition.

Such investigations as Stone of Indiana is making on the non-nitrogenous compounds of foods, and workers in the two Connecticut Experiment Stations, on the nitrogenous compounds of the cereal grains and on the functions and value of nutrients, will, I am sure, ultimately prove of much greater service to Agriculture than that large class of experiments which have a more apparent practical application.

It is worthy of note that the only investigations which have outlived a half or even quarter of a century, and which have exerted a profound influence upon Agriculture as an art, are those of a severely scientific character, — investigations which were carried on in the laboratories of scientists who little dreamed of the far-reaching influence of their labors. The men who have given to the word Science the great meaning and dignity which it now has, have been lovers of the truth for truth's sake, and I sometimes fear that we as a people are not cultivating the spirit of the true investigator as we should. Is it true that our scientific labors are taking on a merely commercial aspect? Are we asking as the introduction to every piece of scientific work the question, How much will it be worth in dollars and cents?

For some, these questions fortunately can be answered in the negative. It is desirable, however, that the enthusiastic scientific spirit shall more thoroughly pervade our Experiment Stations, for we sorely need the inevitable outcome of such a spirit. While it is properly a function of the Station to show how existing knowledge may be utilized, by experiments which serve as object lessons, I believe a more important function at the present stage of knowledge is the discovery of laws and facts fundamental to agricultural methods, leaving the application to farm practice of much of this added knowledge largely with the mass of intelligent farmers, where, after all, it must generally be left. I affirm, then, that the conclusions derived from Experiment Station work should manifest a conservatism that is induced by severe and searching methods of experiment and investigation.

Our attention will now be directed towards the work of the schools. This is of prime importance, because here are to be trained the men who will be influential in determining the status of agriculture. The standing of any profession or business depends not so much upon the kind of work performed as upon the character and quality of the men engaged in it, provided, of course, that the work is honorable. If the social horizon of the tiller of the soil is narrow, it is not because he digs in Mother Earth, but is in part because of his inability to reach out to larger social and intellectual opportunities. While it is not to be expected that all the followers of any calling shall stand in the forefront of social and intellectual life, it is certainly true that if agriculture is to maintain its proper dignity and influence among the world's great industries, politically and socially, it must number among its followers men of the same intellectual ability and wide range of vision that are found in other callings.

Farmers have often complained that lawyers have chiefly legislated for them, but if this is true it is partly because they have not been shown their ability to determine their own political and social status. The conditions that make for supremacy in human society are not nullified or reversed as a favor to the farmer. At the same time that we recognize this fact we must admit another of equal importance, viz.: that the interests of agriculture, whether in legislation or in business and social conflicts, are safest in the hands of its own followers who are qualified by education and experience successfully to compete with opposing interests. For these reasons, then, we are anxious that the training of the schools shall render the best possible service to agriculture in the preparation of its leaders.

In order that this shall be accomplished, we must give place to a conservatism which recognizes the value of past experience in the means and methods of imparting a sound education.

When the land-grant colleges were first organized, a popular notion prevailed that an entirely new order of education was to be established — that the matter and manner of the classical college were to be replaced by other subjects and other methods. The young man was to be trained to do rather than to think. The introduction into the curricula of these schools of such subjects as the modern languages, literature, and metaphysics, or even extended instruction in the sciences, was resented by many as

foreign to the spirit and purpose of the act which made these new institutions possible. Had such views prevailed, the cause of technical education would have suffered great harm. These extremists forgot, or never knew, that a man's mastery of affairs does not proceed primarily from memorizing a catalogue of material facts or from manual skill, but rather from his capacity for severe and logical thought, and that a farmer's success is due not so much to his ability to plough a straight furrow or his capacity for hard labor, as to that analytical power of mind which enables him to discern the right relation of things. To equip a man merely with the technics of the practice of agriculture would fall far short of preparing him for that larger social influence which is essential to leadership or the highest success.

Fortunately, we believe, the four years' courses in agriculture, as now presented by our best institutions, include a fair proportion of general training subjects, combined with such a sequence of chemical, physical, and biological studies, that the faithful student not only attains a cultivated intellect, but is given a systematic insight into the world of matter and of life with which he has to deal. Such courses represent the conservative position, and are a logical result of the experience of the past.

That they do not impart sound learning and can only meet the demands of an inferior scholarship I do not for an instant admit.

It seems, however, that some who are interested in our land-grant colleges place a low estimate upon the educational value of Courses in Agriculture as they now exist. Certain recent utterances concerning this matter are like a dash of cold water in the face, to those who had come to regard the agricultural course in some of our colleges as the peer of any other found there.

The most notable of these utterances is the address delivered last winter before the Massachusetts Board of Agriculture by the able President of the New Hampshire Agricultural College. I propose, in this connection, to criticise some of the main points of this address, because they are based upon what in my judgment is a serious misconception of the essentials of a four years' Course in Agriculture, and because in so doing I may be able to make clear the views I desire to present.

Certain conclusions reached by President Murkland may be justly summarized as follows :

(1.) A "pedagogical form" is a "necessity for teaching any subject," meaning by pedagogical form a logical or progressive series of lessons.

(2.) The Courses in Mathematics and Classics have taken on a fixed pedagogical form, which (inferentially) gives them a maximum value as a means of education.

(3.) Courses of study related to agriculture and to engineering, especially the former, have suffered from lack of pedagogical form.

(4.) Engineering, because so closely allied to mathematics, has found a pedagogical form "ready to its hand in the established form of mathematical teaching," and so is now taught in fairly satisfactory courses of study.

(5.) Courses in Agriculture are in a present "practically inextricable" "confusion," because "with such material for teaching as is now available there is no perspective possible in teaching agriculture;" . . . "and where no other science is involved there is nothing of that orderly sequence in the progress of instruction which has made the classical education, and to some degree the scientific education, a process commanding respect."

These latter statements are mostly quotations from the address under discussion, and are those to which I shall chiefly confine my attention.

Dr. Murkland's strictures on the Courses of Agriculture that now exist are based in part on two assumptions:

(1.) That agriculture is, or is susceptible of becoming, an independent science, so that in classifying it for teaching purposes we may properly speak of "other sciences."

(2.) That the sciences, such as the chemical and biological, which we now recognize as somewhat "precisely formulated," are not a proper and essential part of a Course in Agriculture, and therefore chemistry, physics, and biology do not, and may not, properly lend their pedagogical form to teaching engineering.

For myself, I cannot accept these assumptions. Agriculture is an art, and the Act of Congress of 1862 directed us to "teach the sciences related" thereto. To be sure we may speak of the theories of scientific agriculture as a science, but in order to

teach these theories as theories are taught in engineering courses we must give instruction not merely in "elementary chemistry" but in advanced chemistry, — the chemistry of the plant and animal, than which none is more profound; and what is true of chemistry is true of other sciences in their relation to the agricultural course. No student can be made properly to understand the facts of horticulture, of plant feeding, or of animal nutrition, until he is thoroughly grounded in the botanical, chemical, and physiological facts and principles underlying these subjects, and so, instead of teaching one science, we must teach several.

I do not see how it will ever be possible so to coördinate into a single science, for teaching purposes even, the mutual relations of physics, chemistry, biology, and physiology to the art of Agriculture, so that it will not be necessary to teach the individual sciences, unless the course in agriculture is made post-graduate. What then does the four years' course in agriculture become? Simply the teaching of a collection of sciences, along those lines which lead up to, and involve, a discussion of their application to the art of agriculture. When, therefore, chemistry, physics, botany, and physiology are taught in this relation, they do not lose their identity, but retain the same logical order which they have when taught as pure sciences, and they lend to the course in agriculture the teaching form which is considered so desirable.

As a matter of fact, four years' courses of agriculture, as now offered by some colleges, at least, are really specialized courses in the sciences, differing from the ordinary scientific course by pointing out the applications of the sciences to an art. Are such courses a mistake? Are they framed in accordance with false views? I believe not, and this is the reason for my belief: The real and important need of which the farmer is conscious, is for a knowledge of conditions, and not for methods or for skill in manipulation. When he clearly understands the reasons for that which goes on about him, the right method will appear. The difficulties lie with explanations, not with mechanical processes. And, besides, agriculture is not a business involving such delicate and intricate mechanical operations that attendance upon a college would be justified in order to learn them, although the modern dairy, the forcing house, and the fruit garden do require skill. But I venture to assert that no machines or practical methods have yet become available to the agriculturist, whose use the

clear-brained inmates of our farm homes have failed to master. The spraying of fruit with fungicides and insecticides illustrates how readily the necessary manipulation was acquired when the reasons for these operations became evident. It is the explanation of phenomena, then, which the extended course of study should give in order that the farmer may know how to adapt himself to the varying and complex conditions which he meets in his work.

The same educator, whose utterances I have called in question, has made other statements in his address which should not pass unnoticed. He declares that "arranging different courses of study, in a general agricultural course, is as nearly haphazard a process as anything can be in matters of instruction," and, that "certain text-books may be assigned to the senior year in one of these colleges, with absolutely no reason why they should not have been assigned to the freshman year, or, for that matter, to some year of the preparatory school course."

It would have been gratifying if President Murkland had illustrated this statement by specifying particular studies which are so devoid of relation to other subjects that their place in a course of study is in no way indicated, for then his meaning would be more clear. Did he have in mind the subject of tillage, which, unless considered in the light of the underlying principles of chemistry and physics, would be taught in a manner unworthy an extended course of instruction. Did he refer to the teaching of horticulture, which, to be intelligently and systematically done, must be based upon a previously acquired knowledge of botany? Did he mean the subject of plant nutrition, in which the instruction is always halting and unsatisfactory, if the student knows no chemistry? Or animal nutrition, to the proper consideration of which must be brought more than a smattering of chemical and physiological information? I believe I am fairly familiar with the list of subjects that could properly be placed in a four years' course in agriculture, and I know of no one which does not seem to have its position as closely indicated as is the case with many mathematical and language subjects, and with some subjects the logical order is almost imperatively fixed.

The statements and conclusions lead to a wide range of questions which we cannot discuss here. I will briefly notice one, however. Have the schools of lower grade and the short course in agricult-

ure, such as the "dairy course," no justification? They are abundantly justified both by what the four years' course has failed, and always will fail, to accomplish, and by the actual results which have followed their introduction. They are reaching young men who otherwise might never have had their thought stimulated to greater activity or their eyes fitted for larger vision. They are not ideal. They are not a full substitute for the four years' course, but I am of the opinion that as a means of carrying to the mass of farmers a higher appreciation of exact knowledge, they are likely to constitute the most efficient school effort that we are now attempting. I do most emphatically protest, though, against these briefer courses being regarded as an acknowledgment that the higher and fuller course lacks form and efficiency. The logic of such reasoning is not clear, and scarcely requires comment.

Passing now from that phase of our subject which relates chiefly to the college professor and the investigator, let us consider the need of conservatism in the interpretation to the farming public of its relation to scientific facts and theories. In this particular field of work, aside from the station bulletins, we have to do chiefly with the institute speaker and the editor.

In order that the farmer may be instructed and helped, and not confused, these two popular teachers should display a conservatism that is born of sound and adequate knowledge.

Institute speakers as we now find them include men of a great variety of experience. Today we listen to the man of science and tomorrow to the man of practice, both of whom have their peculiar place and value. It is extremely desirable, however, that the one shall not attempt to occupy the province of the other. While there is an occasional scientist who is familiar with the methods of practice, and a few who till the soil that have a fairly wide range of scientific knowledge, the rule is that the one falls far short of expertness in the domain of the other. It is better that the specialist in some line of agricultural practice shall not feel called upon to furnish a scientific explanation of all that he does, and that the speaker who is expert mostly in some departments of science shall not give too much free advice in regard to the details of farm work. Such a regard for the proprieties will tend to the establishment of greater confidence on the part of the public in those who appear in the capacity of teachers.

It is to be feared, moreover, that there is a tendency to gauge the value and efficiency of an institute speaker chiefly by his ability to amuse an audience, rather than by his credentials for sound and accurate knowledge. This is partly due to the fact that many audiences of farmers are better satisfied with amusement than with an address which requires close and earnest attention. It is certain, however, that just as we now confess the disaster due to the incapacity of religious teachers whose only claim to confidence is a sanctified ignorance, so we can be sure that glibness of tongue is not all the qualification which teachers in Agriculture should possess.

An error may be as effectually presented from the platform as a truth, but it is of vast importance to the hearer whether it be error or truth. A truth expressed in homely phrase is at least harmless and may be beneficial, but an error attractively uttered is always dangerous and may work injury. It is not an exaggeration to declare that some very grotesque science has been proclaimed at farm institutes by men who were out of their proper spheres of discussion, and who therefore lacked the exact knowledge necessary to accurate and reliable statements of a scientific character. This evil it is within the power of those who officially conduct public agricultural discussions to greatly remedy.

We will now consider somewhat briefly the relation of the press to scientific agriculture. What the agricultural editor most sorely needs is not only a conservative mind, but the ability to discriminate between the true and the false, — an ability which does not proceed from a ready and attractive style of writing or from what we in general term the art of journalism, but from a fund of information.

The number of agricultural papers, and papers which have an agricultural page, that are offered to the reading public, is legion. To some of these the farmer is greatly indebted. They are conducted by competent men, who summarize for the readers the best knowledge and thought that are current. Some of them, however, present an aggregation of fact and theory which is without form or comeliness when viewed in the light of truth. Especially remarkable, and to the informed mind exasperating, is the hash so often found in the agricultural page of the religious newspaper, put there, we suppose, because the editor feels it his

duty to illumine a benighted agriculture at the same time that he rescues an erring soul.

There is a great opportunity, though perhaps not yet a great demand, for men especially trained to be editors of agricultural newspapers. These should be men who possess the fundamentals of science and practice, and while they may not be experts in any one direction, they should be so well acquainted with the sources of knowledge and with the status of men and things that they can sift the chaff from the wheat.

This is not a plea for an aristocracy of knowledge based upon an orthodox training in school or out of school, or upon a required assent to the recognized *credo* of science or practice. It is not to be expected that even men of acknowledged authority shall all bring their views to the same dead level, but it would be a relief if we could eliminate from public discussion those speakers and writers whose chief claim to a hearing is that they disagree with the accepted verdicts of science and practice, not because they have had the opportunity exhaustively to examine the foundations upon which these conclusions rest, but rather because, after a superficial observation of the surface of things, they are not able to reach the same conclusions. The theories which these pseudo-scientists weave out of the tissues of their own brains, though generally short-lived, may not only mislead, but do great harm by destroying confidence in the science that is worthy of the name.

It may appear somewhat superfluous to suggest that there is need for conservatism on the part of the farmer, for he has been repeatedly pointed out as an example of excessive caution in the adoption of new ideas. Certainly he has sometimes assumed an attitude of even extreme reserve towards things scientific, and although the best farm practice furnishes abundant evidence that the discoveries of science have taken a firm hold upon the means and methods of agriculture, yet he is disposed carefully to question any new theories or change of practice that is presented to his attention. Such conservatism is wise. The farmer is receiving a great deal of free advice from a variety of sources, which, as we have tried to show, is not always reliable, and until by inexpensive experiments, or by less expensive observation, he secures reasonable proof of the value of a new method or appliance, he does well to adhere to his old and tried ways.

The peculiar characteristic pertaining to the farmer's conservative habit is that it occasionally suffers unfortunate and costly lapses. The owner of generous acres will often resist the teachings of science and experience, and will sneer at the advice of the ablest men in his own calling, only to grasp at the glib promises of the man he never before saw and of whose trustworthiness he knows absolutely nothing.

We find in farm homes, as we find everywhere, a strange expectancy concerning things new and untried. Humanity has always been hoping that out of the land of magic would come the relief from the burdens of life, or the promise and fulfillment of great rewards from little effort. The fraudulent food and fertilizer, the patent medicine, and the wonderful business opportunity which offers a chance to get something out of nothing, all exist because of this unconfessed faith in the extraordinary value of the unknown. It is this credulity concerning things outside the farmer's ordinary experience that renders it so difficult to defeat the schemes which only defraud.

It was not long ago that the farmers of New England paid forty dollars per ton for diatomaceous earth with which to strengthen the stalks of wheat. Even within a year some of our Maine farmers were almost convinced that a certain business concern had so interpreted Nature's methods that it had compounded a fertilizer of whose concentration of power the ordinary manufacturer of fertilizers never dreamed, and it was not easy to dislodge this half-formed confidence in a mixture possessing such unusual properties. Very recently, it was my own duty to warn the stockmen of my State not to put their trust in a certain class of foods, containing constituents of such pretended efficiency that their use would solve the difficulties of profitable stock feeding, by insuring the animals against disease and by stimulating growth and milk production to an unusual degree, and I have not found it easy to convince the public that the knowledge never possessed by the ablest veterinarians and that the food properties never discovered by science, nor revealed to previous human experience, are to be distrusted. Within the present year the efficient and courageous secretary of the Maine Board of Agriculture has had a sharp and prolonged contest with certain Western promoters, who for selfish reasons have been trying, with some degree of success, to convince the dairy-

men of Eastern Maine that through the investment of a generous sum of money they could accomplish results contrary to all business experience and the best knowledge, and he has found that he did not undertake an easy task. Gradually, to be sure, the agricultural public is becoming emancipated from the disastrous influence of the schemer, but there is still need that the Experiment Stations and Boards of Agriculture shall hedge about with all possible safeguards that class of workers who lack the expert knowledge necessary for detecting the false.

No one is infallible, no scientist has attained more than a very incomplete knowledge, and mistakes are a common experience, but we confidently assert that the highest realizations in agriculture lie in the conservative yet broadening influence of the scientific effort that is now being exerted in its behalf.

Discussion.

In the course of his lecture Professor Jordan remarked that underlying all practical matters are principles touching matters of investigation and education. No Experiment Station can ever exemplify, in that broad sense which is required, any new principle. Engineers make use of rules. A book of rules might be written which would be useful to this man but not to that.

He had met six or seven hundred Maine farmers, and their questions had not been how to hoe or shovel or run a machine, but, What is the reason for this or what is the cause of that? In a six weeks' winter course, to which any citizen might be admitted, thirteen boys attended, and were as eager for knowledge as the dry earth is for water. We cannot teach them everything, but can stimulate their thirst for knowledge. The course consisted of one hundred and twenty lectures.

Benjamin P. Ware expressed a sense of appreciation of the lecture. He was glad the professor had recognized the duty of Experiment Stations to protect the farmers. There is a degree of gullibility by which they are often misled; perhaps Yankees more than any other men hope to get something for nothing. The foundation of Experiment Stations was by reason of the imposition practised by manufacturers of commercial fertilizers. Farmers knew they must have something to add to their means

of fertilizing and jumped at the offer. Hundreds and thousands of dollars have been spent for ground oyster-shells and other worthless materials instead of ground bone. He rejoiced to know that though we have been so impatient for conclusions, and that Experiment Stations may have put forth premature results, yet they have effected great savings to the farmer. We now feed balanced rations to our stock; formerly we attempted to make milk from hay alone, and grain was looked upon as an extravagant luxury, but things are different today. Plants require balanced rations as well as animals, and Experiment Stations have taught us how to provide them by chemicals in due proportion.

Professor Jordan said that agriculturists are not the only class who need to attend to underlying principles. He was astonished at the ignorance of well-educated people in regard to common things. He spoke of a judge who would not recognize milk separated by separator as skimmed milk. He asked, How do we educate our farmers' wives? The boys are sent to colleges. Girls study mathematics, French, and the like, with only a little chemistry. When the new home is established, what does the mistress know? A cooking-stove will floor her; she knows nothing of bacteria or the effect of drafts of air, and puts food on the table of which she knows nothing. Children are less rationally fed than animals.

A gentleman told of a neighbor who in making up rations for cows omitted cotton-seed meal, as he was feeding for milk and not for meat. The speaker asked whether cotton-seed meal produces garget.

Professor Jordan answered that hundreds of farmers have been feeding cotton-seed meal for twenty years. Garget is generally caused by something wrong in the management of the cows.

The gentleman said he knew of a man who bought a cow that had been quarantined; he found her down, giving only eight quarts of milk daily; she afterwards rose to fifteen quarts per day. There is much testimony against the use of tuberculin; in many instances the value of cows has been lessened by the process.

Professor Jordan said that quite extended experiments with tuberculin have been favorable. After nine months animals

have been killed, and in each lung have been found encysted tubercles.

A lady said she thought it very shocking that so many of these beautiful animals should be sacrificed. She told of the cures of human consumption which she had seen at her home in Colorado, where the air is so pure and the conditions are so much better than in these coast regions. They never have diseased cattle there, and she did not think it impracticable to send cattle there to be cured.

Professor Jordan replied that he should like to place a few cows, with an incipient disease, under the conditions described.

Mr. Ware spoke of a man who had a cow which he knew was tuberculous; he sold her for ten dollars, and the purchaser took her to the commissioners, who paid thirty dollars for her. In another instance forty-five dollars was obtained for a twenty-dollar cow. Two years ago the owners got one-half the full value of healthy animals for all condemned ones. The law was amended, so that now the full value of a sound cow is paid; this seems to be a premium for rascality.

Thomas Harrison said that the commissioners are bound to compensate for the sacrifice of a cow for the public good.

Henry L. Clapp remarked that the more farmers talk the more they show that they have an eye to the main chance, which is quite right, and asked if this was not an element in the conservatism of farmers.

Professor Jordan answered that he thought Mr. Clapp had gone a little farther than he intended. In feeding or fertilizer experiments we are working with materials that we do not understand. He would not discourage the eye to the main chance.

Mr. Clapp thought boys are wanted to go into business as soon as possible, and their parents do not consider their environment.

MEETING FOR LECTURE AND DISCUSSION.

Saturday, January 25, 1896.

A meeting for Lecture and Discussion was holden at eleven o'clock, the President, Francis H. Appleton, in the chair.

The following is an abstract of a paper read by the author:

Stove Plants in their Native Tropics.

By Professor George L. Goodale, of Harvard University, Cambridge.

In the language of horticulturists, stove plants are those which require a high degree of heat and moisture for their most thrifty growth and their best estate. Without any exception worth mentioning, such plants are natives of the tropics, and it is the endeavor of cultivators to give them conditions of a tropical climate. But it must be clearly understood that within the tropics there are two distinct types of climatic conditions: one characterized by abundant moisture in the soil and atmosphere, and the other by great aridity. In fact, some of the larger deserts lie within the tropics, and yield to our greenhouses only a few plants from their oases. It is merely the difference in the amount of water that makes the difference between any oasis and the sterile waste around it. It is, therefore, only with the plants which are native to the moist parts of the tropics that we have to deal when we examine the vegetation that we confine to our hothouses or "stoves."

Near the equator there is a somewhat irregular and interrupted belt, which runs as a zone around the very warm, moist parts of the earth, and within this zone there is a nearly equable climate. North and south of it there is a dry season, followed by a rainy one, but in the equatorial belt one day is much like every other through the year. The temperature at night is always high enough to insure the best conditions for the growth of plants, and thus to utilize to the best purpose the materials which the green foliage has been preparing during the hours of daylight. Green plants are so many factories for the manufacture of starch and other food and building matters in their structure, and this work goes on only in the light. The only materials needed in this work are carbon-dioxide, commonly called carbonic acid, and water, with small traces of mineral substance, such as salts of potassium, calcium, and magnesium, together with more or less nitrogen.

It is plain that in the tropics, as in our best managed stoves, plants are well provided for all their wants, and all they have to do is to work in the sunlight, and grow at night. There are no climatic foes; all the foes are the competing plants, or the animals at every point. To compete successfully with the one and to resist the other, demands most varied forms and characteristics.

Hence in the tropics we find marvellous diversity of shapes and adaptations, and from this comes the difficulty of understanding that there is a unity which connects even the most varied forms.

The structure of plants may be illustrated by the architecture of buildings, in which the elementary factors are walls, floors, and roofs, to which we might add chimneys and windows. These are found in cathedrals and wayside shrines, in palaces and cottages; however much they may be disguised by decoration or by extrinsic additions of every kind, we can still recognize them and compare them with each other; we can penetrate the most complete disguise, and recognize them even when they have outlived their usefulness and exist only as ornamental vestiges, like make-believe chimneys or false windows. The recognition of these simple elements of architecture is not always easy, but it is always worth while, for we are thereby enabled to trace relations between the most widely separated structures, and to gain some insight into the order of their development. We can even see how the wayside shrine grew into a cathedral, and we can trace the steps by which the development has passed along its course. The recognition of these elements is of further use in such study, since it shows that form is, within certain limits, independent of material, and that whatever material is used must be so disposed that its burdens are kept within its strength. This illustration may now be applied to plants and their underlying architecture.

It is everywhere held truly by botanists that the different organs of all flowering plants are referable to root, stem, and leaf. Here we have the floor, the walls, and the roof. Perhaps root-hairs deserve the same rank, but for the present purposes we must restrict ourselves to the root, stem, and leaf, or even to the more essential stem and leaf.

This reduction of all parts of a flowering plant to such simple elements was the discovery, or rather inspiration, of the poet Goethe, who saw in a misshapen rose, with green leaves where there should have been fragrant petals, the reading of one of the riddles of nature. About the same time — the close of the last century — Auguste de Candolle, a botanist of the highest rank, was led by a careful comparison of the arrangement of leaves on stems with the parts of the flowers, to the conclusion that the flower is a shortened branch, with its parts arranged in an orderly manner, and adapted to special uses. At first botanists were

rather slow to make use of this clew through the otherwise trackless labyrinth of forms, but it is today in the hands of even the students of elementary botany, who can see in the fields of ripening wheat, with its ears of golden grain, leaves, and stems, and roots — all much diversified; and in the blue flax, the scarlet runner, and the rose, leaves and stems and nothing more; and so in all the kindred of those plants which luxuriate in the tropics.

Roots and stems are seldom so greatly disguised as to elude immediate identification, but sometimes leaves are so changed from the familiar type as to defy detection except after close study. But when we have made out the elemental parts and have reduced our otherwise bewildering complex fractions of the vegetable world to their lowest terms, we have before us the materials for working out the family history of plants. Before this subject was made clear by the luminous suggestions of Darwin and Wallace, the expression, "affinity in plants," was a figure of speech rather than an expression of an undoubted fact. How could this be otherwise when all held that species had come down to us in straight lines without any variation wide enough to carry one species beyond the limits which marked it from its nearest neighbors? But in the light of the hypothesis of derivation these lines are seen to be anything but straight: they are tortuous beyond belief, and in their irregular course mark the crooked path of descent.

Therefore, we hold now that these widely separated plants in all climates are, in the truest sense of the word, akin, and if we may borrow a phrase from the sister kingdom, they are of one blood. This belief lends a new charm to all examinations of the diversified organs of plants, and gives to botanical study the attractiveness which attaches to all life histories.

The lecturer next passed to new views acquired in regard to the structure of these plants. Everbody knows that plants are composed of myriads of minute compartments, different in shape and office, which are so combined as to make the organs and constitute the plant. In these compartments resides the living matter or the protoplasm, in which all life is manifested. Up to about fifteen years ago, it was held, on what was believed to be satisfactory evidence, that the living matter in each one of these cells or compartments, was quite separate from the living matter in

the contiguous cells, but better means of research and improved methods have shown that in some cases, and probably in all, the protoplasm in the cell communicates through an inconceivably fine, sieve-like partition with the protoplasm in the neighboring cells, and thus throughout the whole plant there is absolute continuity. Each plant, no matter how complex, is in all its living parts bound strictly together into a coherent coöperating whole.

The bearing of this on the question of propagating plants by cuttings or buds is very important. When a bud is transferred from one plant to another or to favorable soil, and there takes up its life as if it had not been severed from its source, it carries all its ancestral peculiarities with it. If, however, as in the case of the seed produced by the action of the pollen from one modified leaf, called a stamen, on the germ in the ovule or essential part of another modified leaf, there is lacking that close continuity — there is given a chance for variation to come in, and herein the seed differs from the bud. In this field of investigation much is to be done with respect to the perpetuation of acquired characters and those which are more obviously inherited.

At this point, said the lecturer, we may take in review the diversified plants of the tropics and note their peculiarities in their homes. But before passing to the illustrations we must note two points as of the highest importance. First, the showy plants in the tropics are much scattered and are not striking for brilliancy. If you want to see tropical plants at their best you must not visit a jungle, but must see such a stove as that of Mr. Hunnewell at Wellesley. Here, and in similar places, are gathered the treasures from many places in the tropics.

Again, in the tropics stove plants are not so thrifty as under the care of our most intelligent gardeners at the North. Here, under glass, all the caprices and eccentricities of plants are humored, and the plants consequently thrive better than they do where, in the tropics, they have to shift for themselves.

Professor Goodale gave a large series of stereoscopic illustrations of the finest tropical plants in their jungles and glens, and closed by deploring the fact that it is impossible, even in our largest Northern stoves, to bring the largest tropical plants to their finest and most characteristic condition.

The following were among the most striking of the very large

number of views of tropical plants shown by the lecturer. They are not here taken up in precisely the order in which they were exhibited. Palms were illustrated in great variety, both in their isolation and in groups. About twenty of the most prominent species were referred to in detail. Of the banana type, the most surprising was the traveller's tree at Singapore. Bamboos of all sizes were presented under their varied conditions. These and the climbers were of surpassing beauty and interest. Of epiphytic plants, aroids and orchids were shown as they occur in their native homes, and they served to emphasize the point made by the lecturer that in frequency of occurrence and in brilliancy, tropical blossoms, except on the tree-tops, do not compare with our north temperate vegetation. Perhaps the fruit trees of the tropics were as instructive to the spectators as any other of the illustrations exhibited, because in our stoves these so seldom come into bearing and are so seldom seen. The large number of pictures followed each other in very rapid succession, but with sufficient explanation to make them instructive and interesting.

Professor Goodale concluded by speaking of Berg's Physiognomy of Tropical Vegetation in South America, — on the River Magdalena and in the Andes of New Granada, which he had seen in the Library of the Society and which he recommended as a valuable supplement to his lecture.

BUSINESS MEETING.

Saturday, February 1, 1896.

An adjourned meeting of the Society was holden today at eleven o'clock, the President, Francis H. Appleton, in the chair.

The President, as Chairman of the Joint Committee on the Building, reported the following vote adopted by that Committee at a meeting on the 22d ult., a copy of which had been sent to every member of the Society, with notice that it would be presented at this meeting:

Voted, That the Joint Committee on the Building recommend to the Society that they give the said Committee power to offer the property now occupied by the Society for sale, provided that they can obtain a satisfactory price.

After a full discussion of the subject, by a large number of members, the following vote was passed:

Voted, That the Society adopt the recommendation of the Building Committee, and give that Committee power to act.

Charles E. Richardson, Treasurer, read his Annual Report, approved by the Finance Committee, which was accepted and referred to the Committee on Publication.

The following-named persons were appointed by the President a Committee on School Gardens and Children's Herbariums for the year 1896:

Henry L. Clapp, Chairman,

Mrs. Henrietta L. T. Wolcott,	Mrs. P. D. Richards,
George E. Davenport,	Miss Katharine W. Huston,
William P. Rich,	W. E. C. Rich.

It was moved that the President appoint a Committee of three to prepare a memorial of the late Charles M. Atkinson. The motion was carried, and the Chair appointed as that Committee Patrick Norton, Frederick L. Harris, and Kenneth Finlayson.

The same motion was made with regard to Hon. John P. Spaulding, and this motion also was carried, and the Chair appointed the Committee as follows: Joseph H. Woodford, Hon. George Heywood, and Edwin A. Hall.

A letter from Samuel Henshaw, Secretary of the Boston Society of Natural History, inviting the Society to attend a lecture by Herbert Lyon Jones on the "Biological Adaptation of Desert Plants to their Surroundings," before the Society of Natural History, on the evening of February 5, was read. It was voted that the invitation be accepted, and that the thanks of this Society be presented to the Natural History Society therefor.

Charles Wells Hubbard, of Weston,

having been recommended by the Executive Committee for membership in the Society, was on ballot duly elected.

Adjourned to Saturday, March 7.

MEETING FOR LECTURE AND DISCUSSION.

SATURDAY, February 8, 1896.

A meeting for Lecture and Discussion was holden today at eleven o'clock, the President, FRANCIS H. APPLETON, in the chair.

The following paper was read by the author:

SEED CONTROL: ITS AIMS, METHODS, AND BENEFITS.

By GILBERT H. HICKS, of the Division of Botany, United States Department of Agriculture, Washington, D.C.

It seems like a waste of time to call the attention of the farmer, gardener, and fruit grower to the importance of planting good seed. From the remotest period it has been known that men cannot gather grapes from thorns or figs from thistles, and yet this is being attempted to a considerable extent in American husbandry every year.

Many farmers are dissatisfied with the low prices their products bring, with high tariffs and low tariffs, with the weather, and multitudinous other unfavorable conditions for profitable agriculture; yet only a few — a surprisingly small number — attach due weight to the fact that one of the very foundations of success for them is pure seed, germinable and true to name. It is unquestionably true that the present conditions in this country, including the sharp competition with both home and foreign products, render the profitable pursuit of agriculture exceedingly precarious, at least in many cases. I believe, on the other hand, that it is equally true that by proper attention to business, by using the best seeds, the best soil, and the best methods of cultivation and marketing, every farmer and gardener can make for himself a comfortable living and by proper frugality accumulate a substantial store for future necessities.

It is urged that there is already a plethoric yield of agricultural products, — more than our markets demand. While this may apply to inferior or mediocre articles, it does not hold good for those of the best quality. Every year sees a larger demand for first-class vegetables, fruits, and cereals. Americans of the present time are living more highly than they used to, and are willing to pay high prices for the best table luxuries.

The man who raises the best crops, then, is coming out away

ahead of his neighbors who are content to "make a living;" indeed, the time seems to be fast approaching in America when the husbandman who does not apply brains as well as fertilizers to his fields will not be able to make even a living.

The listlessness which exists in some quarters at present must give way to intensive application of the right sort. The trouble is not that the agriculturist does not work hard enough, but that in many cases his labors are misdirected and futile. Of what use is it if a man works a piece of ground early and late, in season and out, if he plants tares when he wants wheat?

Some of the conditions for successful crops are beyond the control of the producer, but such conditions are being gradually lessened.

In the matter of good seed it would seem at first sight that any one could obtain it by paying the price asked. Indeed, some American seedsmen would have us believe that it is difficult in this country to procure any other kind, — that all of the trashy seed of which we read is sold in Europe.

We wish to state at the outset that we have no grievance whatever against American seedsmen as a class; that the trade numbers as honorable men as can be found in any profession; and our remarks at this time will apply only to the abuses of the American seed trade, from the wholesaler down to the hardware merchant or grocer in a country village, who sells his customers old garden seeds that not even the trump of Gabriel could induce to come up.

It makes no difference to the farmer whether his seed comes directly from the large dealer or from the village merchant, if it does not germinate or turn out to be what he ordered. He does not stop to quibble over the point made by a recent writer in an American journal, that a man who sells bad seed is not a seedsman. If this be true, we shall have to get new names for the butcher who sells tainted meat and the grocer who adulterates his wares.

After a careful study of this subject, including the testing of a considerable quantity of seeds and conversation with some of our prominent seedsmen, I am prepared to state without fear of successful contradiction, what any one may easily find out for himself, if he takes a little trouble, that there is an immense amount of trashy and inferior seed sold in this country every year, and we believe the time is fully ripe for the inauguration of seed con-

trol methods in the United States. Such methods would benefit the first-class seedsmen fully as much, if not more, than the consumers themselves.

As it now is even the man who pays a high price for seed cannot always get it, though, on the other hand, it should be noted that some farmers get poor seed because it costs less than a good quality, and therefore they consider it cheap. No intelligent man needs to be told that such seed is dear at any price, and likely to entail a long series of losses from the fouling of his land and the introduction of inferior strains of agricultural plants.

Poor seed may be classified as follows :

1. Impure.
2. Not true to name.
3. Of low vitality.

Impurities may be either accidental, due to imperfect handling or cleaning, such as weed seeds, chaff, dirt, and foreign seeds; or the result of deliberate fraud, as "killed" seed, artificially colored sand, admixtures of seeds of inferior value, etc. If the impurity consists only of inert matter, *i.e.*, sand, chaff, and "killed" seeds, the wrong lies in the fact that the buyer pays for something which is of no value, but which cannot injure his land or crops. On the other hand, where seeds of weeds occur the farmer not only sows but carefully cultivates plants which are not only usurping the place of the crops he desires, but may even poison his family and stock. This last statement is an extreme case, but one not at all uncommon.

If the seeds are not true to name a great loss is entailed to the farmer from the fact that an entire crop, with all the cost and labor it implies, has been wasted. However, in cases of this kind, *e.g.*, if a gardener plants a field to some particular variety of radish and it turns out to be totally different from the kind ordered, the buyer has heretofore had redress by claiming damages against the seedsman for obtaining money by false pretense. Numerous cases of this kind have occurred in America, but dealers are usually careful to avoid such difficulties.

With regard to weed seeds, upon which much stress is laid by Seed Control Stations, it is possible that their baneful effects are sometimes overestimated by those forming an opinion on the value of commercial seed, judged from the standpoint of the

germination of the former. Experiments conducted with a few kinds of weed seeds tend to show that the seeds of some of our native plants produce a small number of seedlings as compared with those of cultivated plants. A large number of our worst weeds are perennial and, although they produce seeds, do not depend upon this method for self preservation; hence their seeds frequently show a small germinating capacity. A very large proportion of our serious annual weeds, on the other hand, produce enormous numbers of seeds, apparently upon the principle that, in some cases at least, but few of them will germinate. Again, the conditions of germination of many weeds seem to be different from those of cultivated plants, in that the seeds of the former often require a long period of rest, and perhaps, also, alternate freezing and thawing, before they will germinate.

However, in such cases, while the injurious effects may not be seen immediately, the weeds are likely to appear in future crops, when least expected. Professor Goff, of Wisconsin, found that seeds of "Redroot" (*Amaranthus retroflexus*) would not germinate at all when fresh, but after being kept for several years in a bag in a dry place they sprouted quite well.

On the other hand, Dr. J. C. Arthur, after conducting a test with various weed seeds at the New York Experiment Station in 1887, came to the conclusion that some species became incapable of germinating after being kept dry three or four months, and therefore he thinks that the danger of fouling land from sowing weed seeds with farm or garden seeds is not so great as commonly supposed. Seeds of Russian thistle, collected October 30, were tested in our laboratory the following May. After fourteen days but 15.5 per cent had germinated. Seeds of the same species one year and a half old failed to sprout at all during the same period.

The truth is that too little work has been done along this line to warrant any definite conclusions. There is a field for study here which is well worth the attention of those engaged in Seed Control. In general, however, it may be said that no seed should be sold which contains as high as five per cent of weed seeds.

In making reports on impurities, the European Seed Control Stations take into account the kind of weed seeds present in a sample. For example, in the Scandinavian Stations the following, among others, are reckoned as "bad" weed seeds: cockle,

chess, Canada thistle, dodder, wild mustard, sow thistle, creeping buttercup, wild chamomile. Such seeds, though they may be scarce in a sample, would readily spread throughout a field. In the case of dodder, Russian thistle, and some other weeds, no commercial seed is worth sowing if it contains a single seed of these species which is capable of germinating.

The third cause of poor seed, namely, low vitality, furnishes the greatest argument for seed control. In this respect the buyer, under present conditions, is most likely to be defrauded, and in such a manner that it is very difficult for him to obtain redress.

Most people judge of the germinating quality of seed from its appearance. If plump, sound, and glossy it is presumed to be germinable. Some go so far as to throw a handful of seed upon a hot stove; if it pops open suddenly it is supposed to be good. Others test their seed by placing a small quantity in water; if it sinks it is thought sound; if it floats it is considered dead. Neither test is at all satisfactory. In the latter case a layer of air closely enveloping the seed often keeps good seed afloat, while poor seed may sink as readily, since the specific gravity of seeds is greater than that of water.

The appearance of seed cannot be relied upon in forming an estimate of germinative ability. An artificial gloss is often given to seed in the process of cleaning. Modern seed-cleaning machinery is constructed not only to take out foreign matter, but also, in many instances, with attachments which clean the surface of the grains. The rubbing of the seeds together, of itself, gives them a glossy appearance. Sometimes polishing brushes are used with the express object of making old seed look like new. Cases are even known where seeds have been rubbed against oiled surfaces for the same purpose.

Without stopping here to discuss the subject of possible injury to the seed coat which any artificial treatment is likely to produce, — a belief which prevails among the best seedsmen of the country, for which reason such seedsmen do not use polishers, — it is evident that a glossy surface affords no certain criterion of the vitality of seed. Furthermore, there is not always strict uniformity in the color of seeds, even of the same variety. Dull-looking seeds often germinate better than shiny ones of the same species. Nevertheless it is true that some seeds, especially the

clovers, rapidly lose their bright color with age; hence in some instances the color test, to the eyes of an expert, is very useful. However, the most practised eye is readily deceived in this respect.

In the matter of vitality the buyer of seed is at a great disadvantage. The dealer usually claims that with proper conditions seed of a considerable age will germinate well. If one purchases seed and it does not come up, the seedsman coolly tells him that it was not the fault of the seed, but of the manner of planting, state of the weather, etc. Most of them in their catalogues take particular pains to emphasize this statement. The dealer says his seed is good, for he has carefully tested it and knows its viability.

Furthermore, the seedsman tells us that, on account of the lively competition in the trade, no man can afford to sell seed of a poor germinating quality, since he would lose his business. How is it, then, that so much badly germinating seed is sold to American farmers? This question is not so difficult to answer as one might think.

The seedsman is in the business for what he can get out of it; he has seed to sell, not to throw away. Like people in all other kinds of trade, he is often caught at the close of the season with much old stock on his hands. Does he test this at the beginning of the next season, and, finding that the germination has decreased ten or twenty, perhaps fifty per cent, sell it to the farmer at a corresponding reduction? There may be such instances, but they are certainly the exception and not the rule.

On the other hand, like a grocer or merchant in the same predicament, the seedsman frequently works off his old stock to the best advantage. This is a common practice, and it is no secret at all among the trade. One of the most prominent clover seed dealers in the United States admitted to me that he sold old clover seed in this way. In other words, if it was not too old he made no discrimination to ordinary customers, but if he found that its germinating power was pretty low he mixed it with fresh seed in whatever proportions it would stand. I have talked with quite a number of seedsmen in the country upon this point, and have yet to learn of one who throws away all of his old seed or sells it to the public at a lower price.

Of course, seedsmen themselves do not pay as much for old

seed as for new if they can help it, but in many cases no difference is made in the small lots sent out to the people, except that care is taken to mix in enough fresh seed to render the sample salable. This, to a large extent, accounts for the fact that rare vegetable and flower seeds often show a remarkably low vitality — a more or less frequent experience of every horticulturist and farmer. In ordinary seasons of business the common seeds move rapidly in trade, but the rare sorts are apt to be left over from year to year. The fact that such seed always costs more than the ordinary varieties makes the evil a very exasperating one.

To obviate, at least in a measure, the troubles arising from planting seed of low vitality, the seedsman frequently advises his customers to sow more seed per acre or rod than experiments have shown to be necessary if fresh seed were used. In fact, I may say, that with the present inadequate knowledge of seeds in this country, where the matter of prudence and economy has not entered into horticultural practices to the same extent as in Europe, there is very often an unnecessary waste in seed-sowing. Better pay more for good seed and sow only what is necessary. Labor will be saved both in the sowing and in thinning out the seedlings. This last point is a very important one where field or garden crops are raised upon a large scale.

If the seedsman would sell two pounds of seed which is fifty per cent below the proper germinating standard at the same price as one pound of standard seed, the dishonest practice — I call it by its right name — of selling low germinating seed would be greatly lessened, but such is not the case.

When seedsmen are asked to guarantee their seeds they make statements like the following (I am quoting now from the catalogue of one of the oldest and most reliable seed firms in the United States):

"Seeds of the best possible quality will fail through improper treatment. Thus, if a small seed be sown so deeply that the young plant cannot reach the surface, the seeds, however good, will fail. More failures result from a want of proper knowledge of conditions necessary to germination than from bad quality of seeds themselves. Besides the conditions" (which are stated) "affecting the germination of the seed, the young plants, after they have made their way to the surface, are liable to various accidents; a sudden current of very cold air, or a continued dry-

ing wind, may check their growth, or destroy the young plants altogether. In addition, there are numerous insects, both below and above ground, that may attack the plants, some of these being so small that they often destroy a crop before they are discovered.

"For the above reasons, we wish to state in this explicit form, that, while we exercise great care to have all seeds pure, reliable, and true to name, our seeds are sold without any warranty, expressed or implied, and without any responsibility in respect to the crop. If our seeds are not accepted on these terms, they must be returned at once."

The above is a fair sample of the kind of guarantees (?) offered by American seedsmen in general. Others, however, warrant seed to be of good vitality and true to name to the extent that they will refund money if not. Strange to say, however, the largest firms almost without exception expressly state that they will furnish no guarantee expressed or implied. But no guarantee from any firm whatever can take the place of an actual test made by a disinterested party.

No one asks the seedsman to guarantee a crop; that would be absurdly unreasonable. Neither, under seed control conditions, is it required that the seeds should come up after being planted in the field. As we shall see presently, in making germination tests the seeds are placed under the most favorable conditions and handled by experts from first to last, so that none of the common objections of seedsmen hold good, that no guarantee can be expected since "the very best seeds do not always give satisfaction on account of sowing too deep or too shallow; too wet or too dry soil; wet weather, cold weather, frosts, chemical changes induced by temperature, etc."

The conditions which affect germination are very complex, and the subject is a very interesting one, but we cannot treat it here. Suffice it to say that not only do different varieties of seed germinate best under conditions different from those of other varieties, but also that differences in season, climate, soil, and locality, difference in the degree of ripeness when harvested, and methods of harvesting and keeping, make it impossible to predicate with absolute accuracy how different seeds of the same variety will behave when they are planted. Nevertheless, the germination of our common garden and forage plants is sufficiently understood by

those who have made a study of the subject, to warrant the adoption of certain standards below which good seed ought not to fall.

As to the vitality of seed, it may be confidently stated that, with possibly a very few exceptions, the germinating power of all cultivated seeds deteriorates after the first or second year, and after three or four years, often after the first, this deterioration is usually very marked. In a few cases, such as cucurbits and flax, it is commonly supposed that seed of two or three years from harvesting is better than fresh. Dr. Wittmack says that the common grass seeds, if properly kept, retain their vitality two or even three years, although, as with clover, one year seed is preferable. He might have added, "if fully ripe when harvested," since most grass seed contains a large per cent of immature grains; a difficulty which is entirely unavoidable in many cases. Hard-coated seeds, such as the clovers and their allies, if kept in a dry place, usually retain their vitality better than seeds of a softer consistency.

Many vegetable seeds lose their vitality in a short time. Here, as in the case of all seeds, great variation exists. For example, in a large series of tests of vegetable seeds made by Professor Goff at Geneva, N.Y., in 1886, it was found that "two germinations of turnip seed seven years old gave ninety-eight per cent of growth, equaling the result to be expected from fresh seed; one sample nine years old, gave sixty-two per cent." But in the majority of instances, the old seed failed to come up well.

It is not necessary to take into account at all the supposed limits of vitality of the different varieties of seed in considering the subject of seed control. What matters it to the gardener if the highest authority in the world tells him that cucumber seed will germinate when it is ten years old, and the seedsman satisfies him that the seed is within that limit? As before stated, the only guarantee worth anything to the buyer is the result of an actual test made by a disinterested and competent person.

The necessity for seed control may be more obvious if we give the results of some tests. Although comparatively little attention has been paid to this subject in America, there are plenty of data at hand showing the need of practical reform in the seed trade.

The lowest vitality and purity is found as a rule among grass seeds, among which class of seeds detection of impurities is the

most difficult, not only to the purchaser, but also to the dealers themselves.

No grass is raised in the United States for seed alone, *i.e.*, on a commercial scale. Most of the seed of Kentucky blue grass, orchard grass, timothy, redtop, and meadow fescue used in this country is American grown. Some other species are raised here, to a greater or less extent, but in no case, so far as I have found, are these grasses cultivated for their seed alone, like a seed crop of peas or cabbage, for instance. This accounts for the fact that frequently large amounts of weed seeds are present in grass seeds. Generally no especial care is taken to rid the grass fields of these pests, and grass, above all other kinds of seed, is the most difficult to clean after it is once harvested. Besides, our meadows generally contain a mixture of various grasses, often of very different value.

Many grasses show an average germination of only thirty to forty per cent, — timothy, redtop, the bromes, orchard grass, the fescues, and a few others, being prominent exceptions. The conditions of the weather at the time grasses flower have a great deal to do with their germinative ability. If a prolonged wet season ensues at this time, only a very small percentage of the seeds ripen. For example: in Germany, in 1871, only five per cent of the seeds of meadow foxtail were germinable for this reason.

Again, the seeds on the same grass plant ripen very unevenly and, in many cases, rattle out easily when fully mature; therefore such seed is usually harvested before fully ripe. Besides, the glumes of ripe and unripe fruits are often so nearly alike in color that it is difficult for the collector to distinguish between them. Hence it is no wonder that pure and germinable grass seed is so hard to obtain. The cheaper grades are mostly chaff and dirt and worse than useless, while those designated "prime" and "fancy cleaned" are often of very little value.

Nevertheless the following table will show that grass seed of a high germinating ability may be obtained in our markets. The figures in the first column are quoted from the price list of a seedsman in the United States and are the results of germinating tests of seed offered for sale by him. It will be noted that these figures are in every instance considerably higher than those of the second column, which are the standards of germination used by Dr. Stebler, director of the Zurich Seed Control Station.

Grass Seed.	American Seedsman. Per cent.	Zurich. Per cent.
Redtop	95	85
Crested dog's tail	85	60
Orchard grass	95	70
Tall meadow fescue	90	70
Sheep's fescue	90	50
Italian rye grass	90	70
English rye grass	96	75
Reed canary grass	85	60
June grass	70	50
Rough stalked meadow grass	80	50

The seedsman adds, however, that these percentages are given as information only and not as a guarantee.

The purchaser ought not to suffer from the fact that, on account of the unfavorable conditions above mentioned, good grass seed is difficult to procure. The dealer should test his seed carefully, and sell it according to its real value. If the buyer is not willing to pay more for such seed than for trash, it is his own fault and he deserves no sympathy.

However, the buyer under present conditions is at a great disadvantage, as the following illustration will show: A sample of seed sold by one of the most prominent dealers in this country for yellow oat grass (*Avena flavescens*), was tested in our laboratory and found to contain 74.4 per cent of impurities, of which over four-fifths was the seed of common hair grass (*Deschampsia flexuosa*), the balance consisting mostly of chaff and weed seeds. Two hundred pounds of this seed was bought by the person who furnished the sample, at a cost of fifty dollars per hundred. Hair grass sells for about ten dollars per hundred pounds, and is practically worthless for lawn or pasture.

The grains of these two kinds of grass are very similar in appearance, and exceedingly difficult to detect without the aid of a lens. The seed of yellow oat grass is imported from Europe, where it is often deliberately adulterated with that of hair grass. It is not likely that the American seedsman noticed the fraud. Of the 25.6 per cent of pure seed, but 11.5 per cent germinated under the most favorable conditions, or a little less than 3 per cent of the entire sample. In other words, there was a loss of about ninety-one dollars out of the hundred which the seed cost,

allowing 100 per cent germination for the hair grass and supposing it to be of any value to the farmer. Of this loss nearly sixty dollars was, in all probability, the result of deliberate fraud upon the part of the European dealers, and reprehensible carelessness, to say the least, in the case of the American seedsman.

Kentucky blue grass showed but 10 per cent germinating power instead of at least 60 per cent, which is a fair standard for this seed. Only one per cent of a sample of Texas blue grass (*Poa arachnifera*) germinated. This grass, like the other Poas, usually shows a low germination, but in the case mentioned the sample was entirely worthless, since when sown in soil not a seed came up. Texas blue grass sells for three dollars a pound in small quantities, or two hundred and fifty dollars by the hundred. Out of four hundred seeds of Bermuda grass but one germinated, or one-fourth of one per cent. Although this grass rarely matures seed in the North, and is generally reproduced by its rootstocks, nevertheless good seed should show a germination of from 40 to 50 per cent, especially in view of the fact that seedsmen ask $1.50 per pound for it whether it comes up or not.

Orchard grass showed a germination of 31.8 per cent in blotters and 24 per cent in soil, as against 70 to 80 per cent, the proper standard. Tall meadow oat grass contained 36.3 per cent impurity, 70 per cent of which consisted of inferior grass seeds and weed seeds, the balance being chaff and dirt. Of the 64 per cent of pure seed 60 per cent germinated, or a little more than one-third of the entire sample.

Awnless brome should show a purity and germination per cent of 90 or 81 per cent intrinsic value. Five hundred pounds of this seed were purchased at regular wholesale prices and a sample submitted to us for test. It showed a purity of 80.8 and 55.5 per cent germination, being an actual value of 44.8, or a little over one-half that of the standard, a money loss of over forty dollars. This does not take into account the farmer's waste of time and labor, besides the injury to his land from sowing the inferior grass and weed seeds of which the impurities consisted.

Italian rye grass tested at the Iowa Experiment Station contained 41 per cent of English rye grass, an inferior plant. This seed comes from Europe and is very often adulterated in this

way. At the same station a pound of orchard grass was found to contain over fourteen hundred seeds of sheep sorrel, besides considerable ergot. Over one-half the bulk of a lot of fiorin (*Agrostis alba*) costing forty-two cents a pound was chaff, and over one-third its weight consisted of chaff and sand. All of the grasses enumerated were sold as good seed, at the regular market price, by prominent American seedsmen.

A test of orchard grass made at the Connecticut Experiment Station a few years ago furnishes a striking example of the need of seed control in this country. Seventeen samples, obtained from regular dealers, were examined. One of them contained no orchard grass at all, but consisted entirely of perennial rye grass, which is very unlike orchard grass, from which it is easily separated. This is an evident case of fraud upon the part of some one, since perennial rye grass is much inferior to orchard grass and costs considerably less a pound. Five other samples contained, on the average, but 25 per cent of orchard grass seed, and of the entire lot only 40 per cent germinated, or less than one-half the standard amount, while in one case the vitality was only $4\frac{1}{2}$ per cent.

The following are the results of some germination tests made by American experiment stations: Redtop 4 per cent, beach grass 2 per cent, meadow foxtail 2 per cent, sweet vernal 5 per cent, tall meadow oat grass 2 per cent, yellow oat grass 2 per cent, soft chess 2 per cent, crested dog's tail 9 per cent, orchard grass 10 per cent, hard fescue 3 per cent, various-leaved fescue 3 per cent, meadow fescue 6 per cent, red fescue 8 per cent, slender fescue 3 per cent, Italian rye grass 4 per cent, English rye grass 12 per cent, reed canary grass 6 per cent, Canada blue grass 11 per cent, wood meadow grass 6 per cent, fowl meadow grass 3 per cent, rough stalked meadow grass 2 per cent.

In the following instances not a single seed sprouted: meadow brome, Schrader's brome, sheep fescue, velvet grass, timothy, water meadow grass, and Kentucky blue grass. We do not know under what conditions these tests were made, and have intentionally selected the minimum results for purposes of illustration, but they certainly afford abundance of argument for the need of seed control in America. The mere fact that such seeds were offered for sale in this country without the purchaser's knowledge

of their real worth is sufficient evidence that something needs to be done for the improvement of agriculture along this line.

Since so much of our grass seed comes from Europe let us turn in that direction for information. The following samples were tested last year at the Zurich Seed Control Station and include grasses from various parts of Europe. One sample of tall meadow oat grass contained 31.9 per cent of chaff. Of Italian rye grass one sample contained 85 per cent awnless seeds, a sure sign of intentional admixture with English rye grass. One sample of crested dog's tail consisted of 46.3 per cent English rye grass, 46.5 per cent chaff and dead grains, and only 7.2 per cent pure seeds; another sample contained 78.7 per cent of chaff and dead fruits. A sample of meadow foxtail contained 81.8 per cent chaff and larva-infested grains, while another one showed but 1 per cent germination.

One sample of tall meadow fescue showed 0 germinating per cent. Seeds of this grass are usually mixed with those of the common meadow fescue, but no particular injury is done, since both grasses grow in the same soil. The latter, however, is a less expensive seed.

Other fescues showed a remarkably low germination: sheep's fescue and various leaved fescue in one instance did not put forth a single sprout. Red fescue germinated in one case but 6 per cent. This grass is said to occur pure in the trade but seldom, being largely mixed with sheep's fescue and various-leaved fescue.

June grass showed the low purity of 28.5 per cent; germination 28 per cent. This grass is frequently adulterated with *Poa compressa*, which in Europe is considered inferior; in fact, one eminent authority classes it as a worthless weed. In America, however, it has some value, but flourishes on a different soil from June grass. Two samples labelled June grass contained 60 and 70 per cent *Poa compressa*.

Velvet grass was found in one instance to contain 96.5 per cent impurity, and one sample germinated but 17 per cent. Seed labelled sweet vernal in some cases proved to be almost entirely the annual variety, a very inferior, if not worthless grass. This adulteration is exceedingly common, and almost impossible to detect.

With the exception of the common meadow fescue and June grass, America depends almost entirely upon Europe for every grass mentioned above, and seeds as worthless as those enumerated are frequently sold in our stores. There is a law preventing America from sending bad pork and beef to Germany, but there is no embargo to prevent Germany and other foreign countries from dumping their poor seed upon our market, a practice which prevails to an alarming extent, accounting in a very large measure for the dodder, Russian thistle, and other dangerous weeds which infest our country.

Grass seeds are not the only ones which are apt to show very low germinating averages. Perhaps, on the whole, flower seeds are still more inferior in this respect. Here I wish to relate a personal incident by way of illustration. One of my very first recollections recurs to a time when my parents, who had gone to a neighboring village to make some purchases, took me with them. As we were leaving a "general" store, I found a ten-cent piece upon the floor. My people were poor, and this was the first money I had ever touched with my own hand, — almost the first I had ever seen. Taking it to the store-keeper he remarked that since the owner was unknown I was as much entitled to it as any one. I need not stop to tell you my feelings, which, however, doubtless those of you who were brought up in the country in humble circumstances can appreciate. Being very fond of flowers it did not take me a moment to decide what to do with the ten-cent piece. Standing before the counter with the most glowing feelings I had ever experienced I called for ten cents' worth of flower seeds. Selecting a package labelled "China Aster," I rode home with great expectations of the beautiful, large flowers which I should obtain from that seed.

My father, having been a practical farmer nearly all of his life, made a flower bed with the greatest care and planted the seeds with equal solicitude. Then I did what thousands of people do every year — waited for them to come up. This was thirty years ago, and not a single one of these seeds has come up yet. The keenness of my disappointment finally turned to disgust, from which I have never fully recovered.

The following germination tests of flower seeds purchased from prominent American seedsmen were made in our laboratory:

Ageratum conyzoides	11.5 per cent.
Double hollyhock	3.3 "
Fine mixed verbena	10.0 "
Japan primrose	0.0 "
Moonflower	0.0 "

A lot of seed bought by us and labelled *Salvia splendens* (scarlet sage) did not contain a single seed of that species. Nearly 85 per cent was seed of a much cheaper and less showy species, both seed and plant being very different from *Salvia splendens*, the seed of which costs about twelve dollars a pound at wholesale. The balance of the sample, 15 per cent, was discolored lettuce seed bearing a casual resemblance to the Salvia, but it had apparently been "killed" so that it did not germinate at all. The whole circumstance indicated deliberate fraud somewhere.

The main reason for the frequent poor quality of flower seeds is the fact that not rarely the same stock is offered for sale year after year. The custom of putting up flower and vegetable seeds in small packets and sending them out in boxes to small storekeepers throughout the country, accounts for a very large per cent of the seed that never comes up. Seed from these boxes is often offered to the public long after it is capable of growing. Much of the flower and vegetable seed received from abroad in bulk, and put up in this way after reaching America, is of a low vitality when our seedsmen get it, and does not improve by remaining in a country store a few years, nor even if it is returned to the seedsman each year, mixed with other seed and sent out in a new box.

Hon. J. J. H. Gregory, the well-known seedsman, in an excellent address delivered before this Society two years ago, speaking of the abuses of the seed trade, said that the agent of one firm acknowledged that a certain package of parsnip seed was on its fourth season's round, although this seed loses a great proportion of its vitality after the first year. He also mentioned a circular received by him thirty years ago from an agent of a firm in the box trade, offering certain varieties of vegetable seed at a wonderfully low price. The agent added that although the seeds were too old to sprout they would do to mix with new seed. Judging from some of the vegetable seed we have tested we are afraid that same agent is still in the business.

As you probably know, many of our varieties of vegetable seed, excepting peas, beans, cabbage, celery, cucumber, and onion, and perhaps a few others, are imported. Such seed, even if of good quality when shipped, sometimes becomes impaired in transit, from dampness or other reasons. On the other hand, on account of the absence of any plan of seed control in this country, the Europeans have an excellent outlet here for their cheap wares, a fact of which they frequently take advantage.

Owing to the methods of culture, as well as their size, form, and weight, vegetable seeds are usually much cleaner than those of grasses and other forage plants. Where seedsmen raise vegetables for seed purposes, they generally take particular pains to keep them free from weeds, a much easier task than in the cases of grasses, clovers, etc. Furthermore, seeds of grasses and forage plants, as a rule, are harder to clean. I am told, however, by one who has been in the seed trade for many years, that there is a good deal of fraud practised by mixing small gravel and sand with vegetable seeds to increase their weight, as such seed is generally sold in bulk by weight. Dirt is sometimes mixed with onion seed, and the excuse made when such impurities are detected that it is impossible to get all of the dirt and stones out of the seed.

Again, "dead" or "killed" seed is sometimes mixed with good seed. An instance, quoted to me by one who was personally acquainted with the transaction, related to a lot of vegetable seed which was received by a certain American firm. The seed proved to be a variety very inferior to that ordered. To make good the loss and avoid detection at the same time this seed was heated until the embryo was killed, when it was mixed with some of the genuine, higher priced variety, and sold as such. Similar instances are reported from Europe and are undoubtedly more common than is generally known.

A few years ago the Maine Experiment Station tested a considerable amount of vegetable seeds bought from American seedsmen. The following are the percentages of germination of seeds obtained from one dealer: Lettuce 0, turnip 4, cabbage 91, parsnip 0, celery 33, onion 0, beet 48, carrot 23, tomato 57, radish 80. Of the ten varieties tested three were entirely worthless, one nearly so, four others below the standard, one nearly up to the proper standard, while only a single variety of them all was what it should have been. I regret to say that in this case a Massa-

chusetts dealer sold the seeds. It is unnecessary to offer more proof that worthless seed is sold every year in American markets, a disagreeable subject and one which needs heroic treatment.

The important question is, What are we going to do about it? Shall we continue to believe that the evils will regulate themselves in the ordinary course of competition, as the seedsman would have his customers think? Experience with commercial fertilizers and adulterated food products ought to be sufficient to satisfy the most sanguine farmer or gardener, that competition among seedsmen is not going to insure him good seed.

More than a quarter of a century ago these same questions were forced upon the attention of European agriculturists as the results of some tests of commercial seed made by Dr. Nobbe, director of the Experiment Station at Tharand, Saxony. Seed control methods were introduced, and as the result there has been a great improvement in the stock offered for sale. Poor seed is on the European market, too, but no man on that continent needs buy it unless he wants to do so. At the present time there are over one hundred seed control stations in Europe, not a single important country being without one or more. Germany heads the list with 38, Sweden has 16, Austria 14, Belgium 9, Russia 7, and France, England, and Scotland one each. Even Japan, Brazil, and Java have one or more, the total number outside of the United States amounting in 1894 to 117. In some cases this work is conducted in connection with a regular agricultural experiment station; in many instances seed-testing alone is carried on. The general plans are similar, although considerable variation in details exists among the different stations. So far as I can learn, there are no laws in Europe compelling seedsmen to furnish good wares, but the result is reached through the pressure of public sentiment, due to the efforts of the Control Stations.

Frequently the work is undertaken in connection with agricultural societies, all of whose members share in the benefits. For example, every agriculturist in the jurisdiction of the Dresden Agricultural Society is authorized to send in to the Experiment Station at Tharand, Saxony, samples of seed bought by him, together with a statement of their origin and cost.

The sample must be taken and sealed before a witness and be a fair average representative of the seed purchased, so that the

dealer cannot dispute the result of the test. Of the smaller seeds, as radish, rape, clover, grasses, etc., at least one-half an ounce must be sent in, and in the case of larger seeds, as peas, beans, cereals, maize, etc., from a quarter to half a pound. The results of the tests are printed in the official journal of the station, which also publishes equitable standards of purity and germination, so that the people may know whether the guarantee of seeds offered to them is of a sufficiently high per cent.

Seed dealers or producers can have the purity and germinative ability of their seeds examined for one or two dollars, according to the size of the seed. Special arrangements are made with parties not members of the Dresden Agricultural Society.

The prices for seed testing vary according to the labor required and the country in which the test is made. A few of the stations are self-supporting, but most of them receive grants from the State to aid in carrying on the work. In many cases so-called "Control firms" are regular patrons of the stations. They pay a certain annual amount for having tests made. To their customers they furnish a guarantee for genuineness, purity, and germinating capacity based upon, but not necessarily equal to, the test made by the station for them, — the "preliminary test," as it is called.

Immediately upon receipt of the seed, the customer can send a sample to the Control Station if desired, and have it tested at a reduction of from one-third to two-thirds from prices charged the dealer, or, in some cases, without expense. This is called the "supplementary test."

The firm binds itself in case its seed falls 5 per cent or more below the germination per cent guaranteed, either to refund the money *pro rata* or to replace the goods, paying transportation both ways.

In supplementary tests made for members of the East-Prussian Agricultural Society, if more than 2 per cent of foreign matter occurs above the guarantee, or 10 dodder seeds per kilogram (about 4½ seeds per pound), the dealer agrees to take back the goods, paying charges both ways, or, at the option of the buyer, to refund from 5 to 10 per cent of the cost for every 5 to 10 seeds of dodder per pound.

Certain conditions exist relating to the amount of seed one must purchase to entitle him to free tests; also to the manner of

drawing and sending samples, limit of the time of the year when seeds can be bought under a guarantee, time for filing claims, etc. The methods of procedure are perfectly equitable for both dealer and buyer.

Not only the results of tests, but also the names of the seedsmen are published by the Experiment Station. This acts as a most wholesome check upon the sale of impure and ungerminable seed, and places the agriculturist in a position to protect himself effectually against the purchase of inferior stock.

The methods of testing seeds may be briefly touched upon. After the sample is received by the station a certain portion is weighed out as a smaller average sample. From this the good seed is carefully selected and the percentage of impurity ascertained. The impurity is divided into inert matter, seed of foreign cultivated plants, and weed seeds. The latter are identified by means of a type collection of seeds kept in the station laboratory.

From the pure seed are taken a certain number of average seeds for the germination test, which is usually conducted in a basement, where the temperature can be properly controlled. This is done by placing the seeds upon shelves in doubled-walled metal chambers, kept at a constant temperature by means of a thermo-regulator. At the Vienna Station the germinating chambers are heated with hot air. In others the cavity between the walls is filled with water kept at a temperature of 20 degrees C. (68 degrees F.). We find the latter method much preferable. Grass seeds are usually transferred for six hours each day to another chamber kept at 30 degrees C. (86 degrees F.), since this daily increase of temperature has been found advantageous.

The seeds are germinated upon damp cloth, asbestos, blotters, porous saucers, or soil. Genuineness of varieties is established by field tests. We make duplicate tests of 200 seeds each, and in most cases conduct comparative tests in blotters and soil at the same time, often supplementing these with greenhouse tests. In short, the seeds are germinated under the most favorable conditions for the particular species involved.

The seedsman is further favored by the fact that there is a considerable difference between germinative ability and *viability*. By viable seeds we mean those which come up through the soil when planted, while a seed is said to have germinated as soon

as the little rootlet called the radicle pushes through the seed coat.

No matter how favorable the soil conditions may be, very often a seed which would germinate upon a cloth or blotter will not come up through the soil from inherent lack of vitality alone. Of course a seed has no practical value unless it has energy enough to push its way up through the ground, but the very fact that seed planted in the open is subject to so many vicissitudes, coupled with the fact that the germination tests upon which guarantees are based are not made in the open ground, gives the dealer whatever advantage there is in Seed Control germination methods.

We do not wish to be unjust to the seedsmen, especially to those who are honorably endeavoring to build up a trade. There is one feature of the matter, however, which must not be overlooked. As stated at the outset, the American farmer of today frequently has an uphill task to make even a livelihood. Certainly he does not often declare large dividends. He has very scanty means under the present conditions of deciding whether the seed he sows, and upon which his bread and butter depends, is what it should be, until the best part of a season has elapsed and it is too late to remedy the effect of sowing poor seed.

How many, who sow grass seed for their meadows and lawns, know whether it corresponds to the name on the package or not? Many of the varieties are unknown to the seedsman himself unless he is an expert in the business, and even experts are deceived in this matter. The more common varieties of seed themselves are often unknown to the ordinary farmer and gardener. He buys his seed almost entirely upon the statements of the dealer, and the dealer is not always reliable.

A few days ago a sample of seed was submitted to me which had been purchased by a New Hampshire farmer for rye grass (*Lolium perenne*). It did not contain a single seed of that species, but every seed proved to be chess (*Bromus secalinus*)! Think of selling a man seed of one of the worst weeds he has to contend with — one which is already a vile pest on many farms! Every honorable person, be he a seedsman or planter, will join in demanding severe punishment of the perpetrator of deeds of this kind. When once awakened to the gravity of the situation, the American farmer will hold some one responsible for such dishonest

practices. No "non-warranty" clause of a seed catalogue will enable the dealer to shirk the responsibility of selling bad seed.

One of the most stupendous frauds in the seed trade relates to the pseudo-new varieties which are sent out with extravagant descriptions and under the most high-sounding names. Accompanying these there may be brilliant colored pictures, perhaps showing a sachaline plant, by whose side a man looks like a dwarf, or a melon too large to be gotten into a wheelbarrow. Generally these "golden-wonder," "mammoth early," sorts are old and well-known varieties sailing under false colors. The experienced gardener may not be deceived by such representations, but other people are. Oftentimes it is largely the buyer's fault, to be sure, since a large number of people seem to delight in being hoodwinked, and will eagerly purchase seed when twenty or thirty packages are offered for one dollar, or four for a quarter, regardless of the fact that they are likely to be cheated in the transaction.

A few weeks ago a case was before the Supreme Court, at Long Island City, N. Y., in which some celery growers sued a seedsman for six thousand dollars damages. They had purchased seed under the name of "golden self-blanching celery," but it turned out to be some kind of wild celery, resulting in an entire loss of the crop. The seed had been sold under the so-called "non-warranty" provision of the seed catalogues which I have already given, hence the Court ruled that damages could not be allowed. The trade journal reporting the case says that the result is hailed with great rejoicing among seedsmen, as no doubt it is, for it means, unless some just seed control laws are enacted in this country, that the gardener, horticulturist, and farmer will have no protection whatever against the abuses of the seed trade.

The dealer claims that he cannot be reasonably required to warrant a variety of seed true to name, since cultivated plants often revert to their native state. If this excuse be valid, the seedsman ought to advertise such varieties as possible reversions to the original stock. He cannot throw the blame upon the grower, since it is the seedsman's business to know that the seeds he sells are genuine, pure, and germinable, and it should be the privilege of the planter to have reliable information upon the same points and in all cases. This is the object of seed control.

Whether seed control methods are adopted in this country or not, every buyer should have some reliable way of ascertaining the value of his own seed. Purity tests will probably not be difficult to make, except in the case of grasses. To identify these will give even the skilled buyer some trouble. If there are no scales within reach, the percentage of impurity can be estimated fairly well by measuring the bulk of pure and impure seeds, though weighing is a much more satisfactory method. In making germination tests, an average number of large, small, and medium-sized seeds should be selected in lots of one or two hundred for each test. In regular seed examination, two lots of two hundred seeds each are usually chosen. Sometimes lots of three hundred are used, the idea being that the larger the number of seeds taken, the smaller will be the chance of error. For practical purposes one hundred will do very well, especially of the larger kinds, as corn, oats, melons, etc.

Since the principal factors affecting germination are heat, moisture, and air, it is necessary to provide proper amounts of each. Seventy degrees Fahrenheit, which is about the temperature of an ordinary living-room, will do very well for most seeds. The supply of a suitable amount of moisture is a more difficult problem than that of temperature, since seeds vary greatly in the amount of moisture required for germination. In general, it may be said that large seeds and those with hard coats will stand more moisture than smaller ones, but different kinds of seed vary so much upon this point, that no safe rule can be given.

Perhaps the plate method is the handiest way of making home germination tests which will prove at all serviceable. This consists in the use of two folds of white flannel cloth, thoroughly wet, between which the seeds, having been carefully counted out, are placed. A soup plate covered with a common dinner plate is used for holding the outfit. The cloths will need to be freshly moistened two or three times a week, according to the dryness of the atmosphere where the plates are kept.

Other simple appliances have been recommended for home testing, such as porous flower pot saucers placed in pans containing water; plates set in similar pans and holding cloths which dip into the water so as to keep the moisture constant, etc. Probably the surest way to ascertain the germinating power of seeds is to sow them in soil in a flower pot (or, preferably, a

"flat"), covering them very lightly with soil or fine sand, and keeping the pots closed to retain the moisture. Seeds cannot be examined so well from time to time, however, if this method is adopted.

In making tests the seeds should be looked over every day, those which have sprouted being removed, and a record kept of the same. At the close of the test, the hard seeds remaining should be cut in two with a sharp knife, to ascertain whether a live germ is within. In such cases due allowance should be made, as a certain per cent of these seeds would probably have germinated in a longer time.

Ten days is sufficient for testing the germination of the cereals, clovers, and most vegetable seeds, except beet and carrot, which require at least fourteen days. The majority of grasses need twenty-one days; timothy and rye grass, however, require but fourteen, while the Poas need twenty-eight days. Tree seeds require from twenty-eight to forty-two days, or longer, and special germination methods. There is usually enough air within the seed or immediately surrounding it, to suffice for the mere act of germination, which is all we are concerned with at present.

Each kind of seed is said to have a certain germinative energy, by which is meant the period required to sprout one-half or more of the seeds of a fresh and good sample of that species. This period varies from three to seven days in most commercial varieties, and is a matter of considerable importance, especially where a prompt decision is wished on the supposed germinative value of a sample under consideration. For example, if a certain lot of radish seed does not show fifty per cent of germination within three days, it is probably old seed. Likewise, if seed begins to get mouldy after a few days' germination trial, it may be pretty safely set down as old stock, provided the test has been properly conducted.

However, no system of private seed inspection or testing, either by the dealer or grower, can secure the end desired; namely, accurate information as to the quality of all seed offered for sale, as well as the exclusion of wares containing seeds of weeds which would prove a serious menace to agriculture.

The seedsman may test his seed with the utmost care, as many do, but so long as he furnishes no guarantee to the buyer, such

tests are not necessarily of any value whatever to the latter. On the other hand, neither the seedsman nor the buyer would have equally as good facilities for testing seeds as a Control or Experiment Station devoted entirely to that purpose.

With our present system of State Agricultural Experiment Stations it seems as if seed control work in this country could be best undertaken by some of them. The Department of Agriculture stands ready to furnish any assistance along this line which properly comes within its province.

A few of our stations have paid some attention to the testing of seeds, particularly the North Carolina station, but no definite control has yet come from it. A course on practical seed-testing should be given in all our agricultural colleges, as there is great need in this country among farmers and others for a good knowledge of seeds, further than that which is now furnished almost exclusively by seed catalogues, — a very dubious source of information in many cases.

Practical lectures along this line should be given at farmers' institutes, before agricultural and horticultural societies, etc., until the farmer and gardener become alive to the importance of the subject and the need for some system of Seed Control.

I would like to see this Society take steps for the introduction of Seed Control measures within this State, perhaps asking the Legislature to appropriate an adequate sum for equipping and conducting a Seed Control Station, at the same time requiring dealers to furnish their customers with a guarantee of the germination and purity of all seeds sold by them.

It is not likely that such a bill would be passed without great opposition from the petty dealers and quacks in the seed trade, for it would be a great blow to their operations. On the other hand, although the cost and trouble involved might inconvenience the honorable seedsmen more or less at first, there is no question that in the end such seedsmen would be greatly benefited along with the farmer and gardener, and it is for the best interests of the trade as well as the vast army of seed planters in this country that we make this plea for seed control in America.

In this paper we have not had time to deal with the importance of grading seeds according to size and weight. As a usual thing no attention is paid to this matter in the seeds offered to home buyers. When clover seed, for instance, is shipped abroad, our

exporters are required not only to equal the sample furnished in purity and germination, but it must be up to a certain grade in size. Foreigners recognize the fact, which our people have scarcely begun to appreciate, that there is a great difference in the value of seed wares, even in the matter of size alone, large seed as a rule producing better plants. Seed selection, however, is a great subject by itself and merits special attention at some future time.

Here I wish to reiterate and emphasize the statement made at the outset, that in speaking today of the evils of the seed trade, no matter what impression our remarks may leave, we have no reference at all to the honorable dealer, by whom we mean the seedsman who is not guilty of any of the fraudulent practices mentioned herein. We leave to others judgment on the man who sells bad seed through ignorance or carelessness, instead of intent, recalling, however, the common principle that "ignorance is no excuse."

In conclusion we will state a few benefits of seed control, among the many which might be given :

1. Seed control would furnish reliable and non-partisan information of the real worth of commercial seeds.

2. The publicity given to the tests would act as a great incentive to dealers to furnish only good seed.

3. The honorable seedsman would be protected against the dishonorable dealer with whom he is now obliged to compete.

4. The farmer, gardener, and horticulturist could ascertain, free of cost, or for a small amount, the value of seeds purchased from dealers connected with the seed control.

5. The impositions which are now frequently practised by seedsmen upon the ignorance and credulity of their customers would be greatly diminished.

6. A universal and thorough system of seed control in America would lessen in a great measure the importation of bad weed seeds.

7. The interest awakened among farmers and others in a practical study of seeds, together with the knowledge upon the subject disseminated by the stations, although a secondary benefit, would be of immense value to American agriculture and horticulture.

Discussion.

Mr. Hicks illustrated his lecture by four charts.

(1.) Cotton seed and its germination.
(2.) Grass "seed" adulterations.
(3.) Commercial grass "seed."
(4.) Red clover seed and its principal impurities.

William C. Strong said that he had had painful experiences with seeds and could see a great difficulty in the matter of guarantees; it is a hard question for seedsmen. He had had weeds come up with his seed, and feels that we ought to take some action. He requested Mr. Hicks to tell exactly what ought to be done.

Mr. Hicks replied that after briefly stating the necessity to the Legislature, an appropriation ought to be asked for (probably not more than three or four thousand dollars would be needed for this purpose) to start a Seed Control Station. Such a station could be managed either in connection with this Society or some other good horticultural or agricultural society, or by the State Agricultural Experiment Station. Experiment Stations do not receive money enough to carry on this line of work to any extent, but they usually have experienced men, greenhouses, etc., which would make them the best places for the location of seed-testing stations. The sale of seeds containing dodder, Russian thistle, and similar pests, should be prohibited by law. A general law that no common seed should contain more than five per cent of impurity should be established. As the germinative capacity of seeds cannot be determined by mere inspection, dealers should be required to have their seeds tested and should state the percentage which will vegetate, a certain amount being allowed for variation in tests, and should fix their prices accordingly.

Robert Farquhar wished a lecture like this could be delivered before every farmers' institute in the country. Some farmers, he said, do not appreciate the cost of producing good seed. A very interesting lecture could be given on the methods used by good dealers in testing. The impression may have gone abroad that no seedsman could be sued, but such is not the case. A farmer bought two pounds of Purple-top Flat turnip, and said it produced Ruta-baga turnips. Mr. Farquhar proved that his seed had never been sown, but Ruta-baga had. The duty of every

seedsman is to sell seed of the best quality. If seedsmen knew that their seeds would be tested and advertised it would tend towards purity.

Hon. James J. H. Gregory spoke of the risks and cares of the seed business, and the wrong impression often drawn by the planters, who frequently accuse the seed-grower unjustly for failure caused by their own mistakes. First-class seedsmen have to, and do, both as a matter of conscience and business wisdom, destroy a great quantity of seed on account of low vitality; seeds are not like grain, and are never graded; if they were, they might be sold at lower prices. Onion seed some years is as high as ninety-five per cent in germination; other years seed of the same varieties, though quite new, is very poor in germinating quality. Old seeds will sometimes push out a root, and go no further. Tests under cover are not like tests outside. We want to encourage public sentiment for good seed. The many risks incidental to the business all show the advantage of seedsmen growing the seed they sell. We cannot believe that seedsmen, as a rule, sell worthless seed.

Varnum Frost thought a great deal depended on the persons sowing the seeds. The nature of the seeds must be known, and the conditions should be favorable for seed to germinate. Seeds of Cucurbitaceous plants, such as the melon, squash, and cucumber, require different soil temperatures and degrees of moisture from those needed by dandelions, lettuce, peas, celery, and beets; the latter class do better in lower temperatures with more moisture. Weather conditions contribute more to the germination of seed than anything else. In conclusion, after fifty years' experience he said he would not dare to sell seed which he had grown himself under the best conditions, to persons who do not understand the requirements of each kind of seed, if he had to guarantee them. Under no circumstances could a man do business on this plan.

Mr. Hicks made a point that a great deal depends on the methods of sowing. Testing, however, should not be left entirely to the farmer or to the seedsman. Trained and efficient persons connected with a station thoroughly equipped for the purpose, should conduct impartial tests in the laboratory, in the greenhouse, and outdoors. Some kinds of seed will not germinate well in cloth. June grass comes up best in the soil.

MEETING FOR LECTURE AND DISCUSSION.

SATURDAY, February 15, 1896.

A meeting for Lecture and Discussion was holden today at eleven o'clock, the President, FRANCIS H. APPLETON, in the chair.

The following paper was read by the author:

ON SOME SCALE INSECTS.

By L. O. HOWARD, Chief of the Division of Entomology, United States Department of Agriculture, Washington, D.C.

All over the country orchardists are now greatly interested in the subject of scale insects. This revival of interest in these creatures among growers of deciduous fruit trees in the East is largely the result of the establishment in this part of the country of the San José scale. Other species, however, have become prominent of late, and general treatment for scale insects is gradually becoming one of the elements of successful apple, pear, and peach growing. One of the principal and most fortunate results of this appearance of the San José scale in the East — if such a disaster can be called fortunate from any point of view — is the direction of the attention of all persons interested in, or in any way connected with, fruit and shade or ornamental trees, towards the great evils which are liable to be brought about through the distribution of diseased stock by nurserymen, and towards the whole subject of legislation against injurious insects. It is my purpose in this paper to lay before you some of the facts concerning the most important of the scale insects which are to be found, or are liable soon to occur, upon your fruit and shade trees; to discuss to some extent the matter of remedies; and to dwell more particularly upon the two great questions referred to.

The State of Massachusetts is rather fortunately situated with regard to injurious insects, and the methods of cultivation generally adopted are advanced in their character. Clean cultivation is the rule, and horticulturists are an exceptionally intelligent class of people. Holdings in general are small, and the State is far enough north to escape many of the most important insect pests. Even Massachusetts trees, however, suffer from the attacks of a number of injurious species, and there are still others which are as yet to be found here in small numbers only, whose increase is to be guarded against; and others, again, which are

liable to be introduced into the State upon nursery stock, and which will certainly flourish here if once introduced.

In speaking of the State of Massachusetts as a whole it must be remembered that the same conditions do not prevail over the entire State. You have a double watershed from an elevated north and south ridge, passing through the vicinity of Worcester, sloping gradually towards the eastern seacoast in one direction and towards the valley of the Connecticut river in the other. West of the Connecticut river there is a more abrupt rise to the Berkshire hills, and thence a descent of almost equal abruptness to the valley of the Hudson river in New York. It results from this conformation that more southern forms are found in a comparatively narrow strip up the valley of the Connecticut river and to a lesser extent up the seacoast, than in other and more elevated portions of the State; and experience has shown that certain insects will establish themselves in these strips which will not continue to reproduce and multiply when accidentally introduced into other Massachusetts localities. This principle, which is now fairly well established, has especial significance in considering the question of the possible future damage in Massachusetts by two of the most important scale insects injurious to fruit trees; I refer to the San José scale and the so-called West Indian peach scale. So far as our experience goes (and this experience may be said to be based upon more than negative evidence) neither of these species will prove itself especially injurious in regions which belong to the transition life zone, which includes all of Massachusetts except the strip mentioned. It is even likely that both species will die out if introduced at any point in this life zone.

The San José scale, as you know, was brought from California on the Kelsey plum, to two large nurseries in New Jersey — those of Parry Bros., at Parryville, and J. T. Lovett, at Little Silver — in 1886 or 1887. The trees were undoubtedly thoroughly infested when received; did not thrive; and in both cases most of them were ultimately taken up and destroyed. The stock, however, had been multiplied by nursery methods, and from the original stock and that subsequently obtained, the scale spread more or less completely through both nurseries in question. Now, from that year until 1893, both these nurseries (and as you know, both, during that period, did an enormous business) sent

out nursery stock north, south, east, and west, and a certain proportion of this stock carried upon it the San José scale. The scale was not recognized until the summer of 1893, when I found it upon some pears from Charlottesville, Va. Since that time my investigations have resulted in the ascertaining of nearly two hundred points in which the scale has established itself and become destructive. Not one of these points is in territory which clearly belongs to the transition life zone, and yet who can question the statement that thousands and thousands of young trees bearing this scale must have been sold to fruit growers located within this region, and have been planted by them.

Even considering the San José scale by itself, the evidence is entitled to great consideration, and to my mind is sufficiently strong to form a basis for a guarded prediction. But it must be further remembered that this is but a single instance among very many known to us, and that it is upon the mass of facts we are basing our knowledge of the indications of the general laws which govern the geographical distribution of species.

There are, however, localities in your State where the San José scale and the West Indian peach scale are liable to do great damage, and it thus becomes necessary for fruit growers to inform themselves about both species. I have now in proof a complete bulletin referring to the whole subject of the San José scale, which it will give me pleasure to send to any members of this Society who care to apply for it, so that it will not be necessary here to treat of this insect at any great length.

The life history of all scale insects may be briefly summarized very much as follows:

The eggs are laid by the adult female either immediately beneath her own body or at its posterior extremity. Certain species do not lay eggs, but give birth to living young, as do the plant lice. This abnormal habit is not characteristic of any particular group of forms, but is found with individual species in one or more genera. The young, on hatching from the eggs, are active, six-legged, mite-like creatures, which crawl rapidly away from the body of the mother, wander out upon the new and tender growth of the tree, and there settle, pushing their beaks through the outer tissue of the leaf or twig and feeding upon the sap. Even in this early stage the male insect can be distinguished from the female by certain differences in structure. As

a general thing, the female casts its skin from three to five times before reaching the adult condition, and beginning to lay eggs or give birth to young. With each successive molt the insect increases in size and becomes usually more convex in form. Its legs and antennæ become proportionately reduced, and its eyes become smaller and are finally lost. As a general thing it is incapable of moving itself after the second molt, from the spot where it has fixed itself, although certain species crawl throughout life. The adult female insect, then, is a motionless, degraded, wingless, and, for all practical purposes, legless and eyeless creature. In the armored scales she is absolutely legless and eyeless. The mouth parts, through which she derives nourishment, remain functional, and have enlarged from molt to molt. Her body becomes swollen with eggs or young, and as soon as these are laid or born she dies.

The life of the male differs radically from that of the female. Up to the second molt the life history is practically parallel in both sexes, but after this period the male larva transforms to a pupa, in which the organs of the perfectly developed, fledged insect become apparent. This change may be undergone within a cocoon or under a male scale. The adult male, which emerges from the pupa at about the time when the female becomes full grown, is an active and rather highly organized creature, with two broad, functional wings and long vibrating antennæ. The legs are also long and stout. The hind wings are absent, and are replaced by rather long tubercles, to the end of each of which is articulated a strong bristle, hooked at the tip, the tip fitting into a pocket on the hind border of the wings. The eyes of the male insect are very large and strongly faceted. The mouth parts are entirely absent, their place being taken by supplementary eye spots. The function of the male insect is simply to fertilize the female, and it then dies. The number of generations annually, among bark lice, differs so widely with different forms that no general statement can be made.

As a general rule scale insects have been divided, both from the classificatory standpoint and from the standpoint of practical remedial treatment, into those which are armored or secrete scales over their bodies, and those which are naked and have no differentiated scale. From the practical standpoint, however, this division is of no great use, since even the so-called naked

scale insects become so hard-bodied, and their integument is composed of such solid chitine, that they are practically as resistant to the action of washes as are those species which have a dense scale of wax. A better classification, when we are considering the matter of remedies, is to divide the group into those species which give birth to living young and those which lay eggs. The object of this division will be at once apparent. Those scale insects which give birth to living young, drop a number of young per day for a comparatively long period. Those first hatched become resistant to the action of washes within a few days, so that at no one time do we have even a majority of the insects in the young and unprotected condition in which washes, weak enough to do no damage to the foliage, will kill them. With the scale insects which lay eggs, on the contrary, there is a more or less definite hatching period. In other words, all the eggs in a given generation hatch at approximately the same time, and the majority of the young are in a condition to be killed by weak washes at about the same time. The species that give birth to living young can therefore be treated to advantage only in the winter, when there will be no danger of injuring the foliage of the trees by the action of washes which are strong enough to kill the insects under their scales. The best example of this class is the San José scale. The egg-laying species, as exemplified by the common oyster-shell barklouse of the apple, pass the winter (most of them) in the egg condition under the old mother scales. They hatch, approximately all together, the latter part of May or in June, and at this critical time may be destroyed by the dilute kerosene emulsion.

Let us hurriedly, then, take up a number of species, all of which Massachusetts fruit growers should know. But a few words need be said about each, since the illustrations on the screen and the specimens which I shall exhibit afterwards, will convey a more definite idea of the appearance of the insects than any words of description.

The lecturer next gave a brief account of the following species, of some of which engravings from the publications of the Department of Agriculture are here presented :

The San José scale (*Aspidiotus perniciosus*), Fig. 1.

Oyster shell barklouse of the apple (*Mytilaspis pomorum*), Fig. 2.

FIG. 1. — *Aspidiotus perniciosus* (The San José or Pernicious Scale), on pear fruit and twig, with enlarged male and female scales. (*From U.S. Dept. Agric.*)

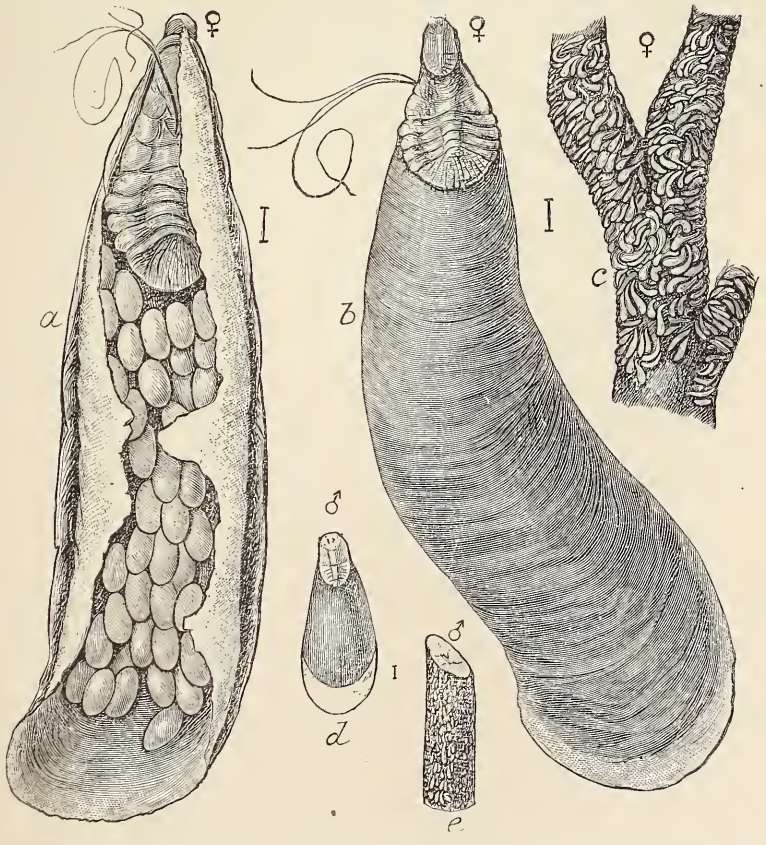


FIG. 2. — *Mytilaspis pomorum* (The Oyster-shell Bark Louse): *a*, female scale from below, showing eggs; *b*, same from above — greatly enlarged; *c*, female scales. (*From U.S. Dept. Agric.*)

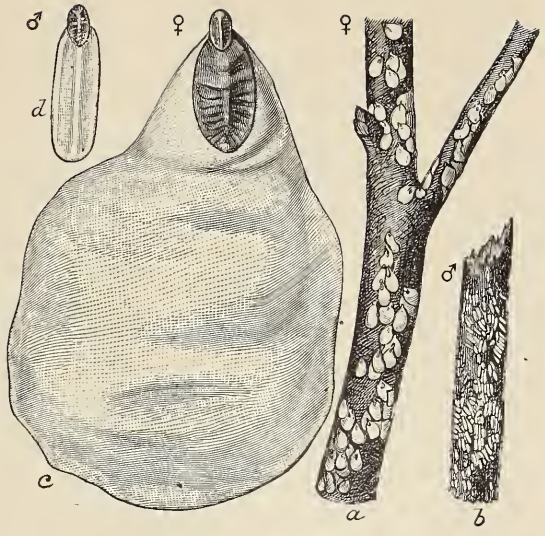


FIG. 3. — *Chionaspis furfurus* (The Scurfy Bark Louse) : *a*, *c*, females ; *b*, *d*, males — *a*, *b*, natural size; *c*, *d*, enlarged. (*From U.S. Dept. Agric.*)

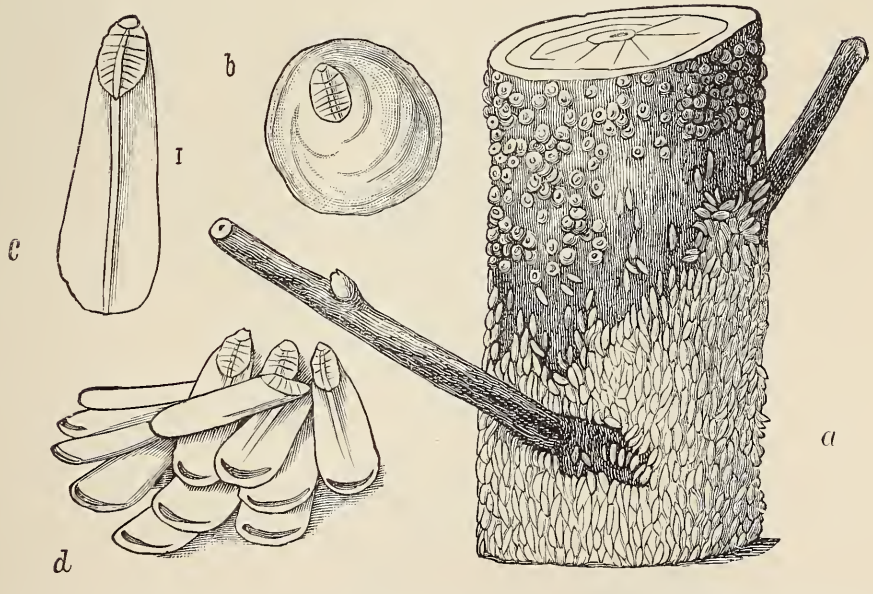


FIG. 4. — *Diaspis lanatus* (The New Peach Scale) : *a*, branch covered with male and female scales — natural size; *b*, female scale; *c*, male scale; *d*, group of male scales — enlarged. (*From U.S. Dept. Agric.*)

FIG. 5. — *Diaspis rosæ* (The Rose Scale) : 1, natural size on twigs; 1*a*, female scale — enlarged; 1*b*, male scale — enlarged. (*From U.S. Dept. Agric.*)

FIG. 6. — *Chionaspis euonymi* (The Euonymus Scale) : Scale natural size on leaf and twig; *a*, male scale — enlarged; *b*, female scale — enlarged. (*From U.S. Dept. Agric.*)

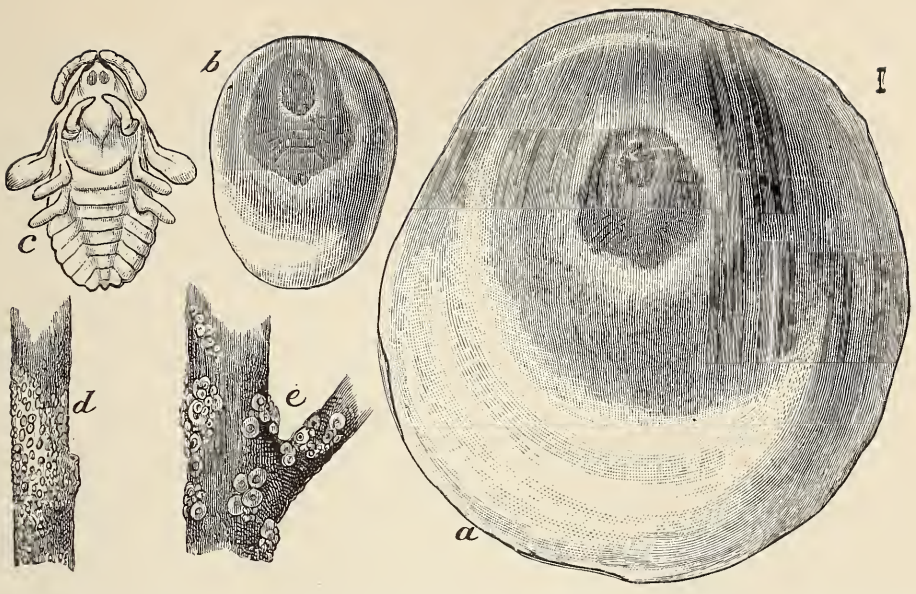


FIG. 7. — *Aspidiotus Juglans-regiæ* (The English Walnut Scale): *a*, female scale; *b*, male scale; *c*, male chrysalis; *d*, male scales on twig; *e*, female scales on twig — *a*, *b*, *c*, enlarged; *d*, *e*, natural size. (*From U.S. Dept. Agric.*)

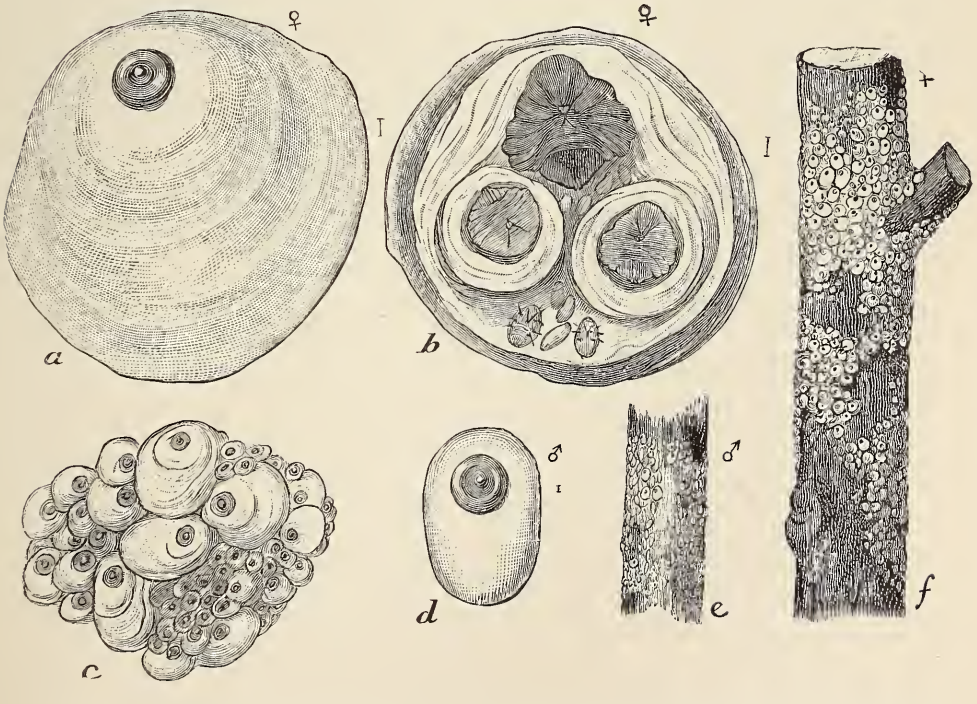


FIG. 8. — *Aspidiotus camelliæ* (The Greedy Scale): *a*, female scale from above; *b*, same from below; *c*, mass of scales as appearing on bark; *d*, male scale; *e*, male scales on twig; *f*, female scales on twig — *e* and *f* natural size; *c*, considerably enlarged; *a*, *b*, *d*, greatly enlarged. (*From U.S. Dept. Agric.*)

Scurfy barklouse (*Chionaspis furfurus*), Fig. 3.
West Indian peach scale (*Diaspis lanatus*), Fig. 4.
Rose and blackberry scale (*Diaspis rosæ*), Fig. 5.
Euonymus scale (*Chionaspis euonymi*), Fig. 6.
Beech and Linden scale (*Prosopophora sp.*).
Willow scale (*Chionaspis salicis*).
Imported oak barklouse (*Asterodiaspis quercicola*).
Cottony maple barklouse (*Pulvinaria innumerabilis*).
Maple leaf scale insect (*Pseudococcus aceris*).
English walnut scale (*Aspidiotus juglans-regiæ*), Fig. 7.
Rapacious scale (*Aspidiotus camelliæ*), Fig. 8.
Common plum Lecanium (*Lecanium prunastri*).

Remedies for Scale Insects. — Experimental work with remedies for scale insects was begun by the Department of Agriculture in 1880, at a time when Professor Comstock made his extensive investigation of the insects of this group. The recommendations which he made at that time practically focussed upon whale-oil soap. In California he found that this substance, applied at the rate of three-quarters of a pound to the gallon of water and at a temperature of one hundred degrees Fahrenheit, killed every individual of the red scale upon orange. Two years later the remarkable work of Mr. H. G. Hubbard upon the scale insects of the orange in Florida resulted in the systematizing of the work with kerosene emulsions, and demonstrated that no better mixtures can be applied to unprotected scale insects than a solution of the standard kerosene soap emulsion in ten parts of water. Mr. Hubbard's results were widely published, and his mixture remained from that time until two years ago the generally accepted and almost solely used remedy against scale insects. No satisfactory experiments with winter washes were made in the East until the winter of 1893–94. California workers had, in the meantime, however, developed a line of washes based in the main on lime, salt, and sulphur, or lime, sulphur, and blue vitriol, or resin, caustic soda, and fish oil. In the winter of 1893–94 extensive experiments were begun at the Department of Agriculture in Washington, and these California washes were naturally tested at the start. It was found, somewhat to our surprise, that although the evidence in favor of their efficacy on the Pacific slope was not to be doubted, in the East they were practically of no use. By no means all of the scales were killed, and in some

instances such an absurdly low proportion of the insects died that this line of experimentation was soon abandoned. The reason for this extraordinary difference in the efficacy of these washes may be laid partly to differences in the average winter temperature between the two sections, and partly to the great difference in precipitation in the early part of the winter.

Following these early experiments, many other substances, in many combinations, were tested, and, not to worry you with details, the practical outcome has been that for dormant trees affected by practically any scale insect, the best wash beyond all doubt was shown to be whale-oil soap in considerable strength. Some species are more susceptible to the action of the wash than are others. Even against the extremely hardy San José scale, one and three-quarters of a pound of the soap to the gallon of water, put on thoroughly, has proved absolutely effective. It is advised that the applications be made in the autumn after the leaves fall, and again in the spring before the buds burst. Little or no harm will be done if the application be made at even a later date, since in April peach trees in full bloom have been treated with no serious consequences. Experiments on a large scale seem to show that the fall application has occasionally an injurious effect in limiting the amount of bloom the following spring, but the increased vigor of the plant probably more than offsets the falling of the bloom.

The greatest difficulty with the soap washes, and one which must be obviated before uniform results can be hoped for, is in the varying strength and character of the soap used. No two brands of soap on the market are alike, and the differing results which are obtained by experimenters are undoubtedly due in large measure to the character of the soap itself, in connection, of course, with the varying climatic conditions. In addition to securing a good strong caustic soap, one is wanted which, at the strength employed on cooling, will not become a semi-solid or glutinous stringy mass, as do most of the ordinary soaps and also many of the fish-oil soaps of more recent manufacture. The old whale- or fish-oil soap employed in the original experiments could be sprayed in solution at three pounds to the gallon, and this is a most necessary characteristic. It is highly desirable, therefore, that soap makers should be encouraged to undertake the manufacture of a definite brand of soap which can be

relied upon to be uniform in composition and strength, and, if possible, to have some authoritative supervision to insure such results.

We have, then, two mixtures upon which we can rely. First, the standard kerosene emulsion, diluted with ten parts of water, for application to the trees while in full foliage in summer and autumn. Second, whale-oil soap at one and three-fourths pounds to the gallon of water, applied in the late fall and early spring to the dormant scales.

Natural Enemies of Scale Insects. — The extraordinary results which followed the introduction of the Australian ladybird (or ladybug as it is more frequently called) into the orange groves of California at a time when their complete destruction was threatened by the white or cottony cushion scale, have attracted an enormous amount of attention to this method of fighting scale insects. As has been repeatedly pointed out in the publications of the Department of Agriculture, this instance was exceptional, and, in fact, practically unique. We had an imported insect to deal with; we had ascertained its original home; we knew that in its original home it was not abundant or destructive, and that therefore it was being kept in check by some specific enemy, since other species of scale insects abounded there and were injurious to vegetation. With no other imported scale insect at the present day do we have these grounds to work from. Nevertheless, this fact is ignored, and persons whose orchards are suffering and who are disinclined to go to the trouble and expense of spraying, are continually agitating the question of parasites and natural enemies. The first Australian ladybird, the Vedalia, as it is called, is being constantly asked for for all sorts of scale insects, and its careless distribution has, in one instance at least, resulted not in a benefit to the section into which it was introduced, but in a great detriment, since, with the predatory insect itself was sent a supply of the fluted scale as food, and when the specimens were liberated the Vedalias died and the scale insect established itself in new territory. A great deal has been said about the merits of the later importations of predaceous insects from Australia to California. Mr. Koebele, the original discoverer of the Vedalia, during an extended trip to New Zealand and Australia, sent to California a number of species of Coccinellids, which were found by him to

feed upon several species of destructive scales. That some of these later importations have multiplied and done good work in restricted localities, there seems little doubt, judging from the emphatic statements of members of the California State Board of Horticulture and their agents and employees. Statements from others as to the inefficacy of the importations are almost equally emphatic, and it is difficult for a person in the East to gain a clear idea as to the present condition of affairs.

The greatest danger in undertaking to use parasites and predaceous insects experimentally on a large scale is that time and money are lost in a dreary waiting for results which may never be achieved. I would, nevertheless, not be understood as condemning careful experiments in this direction, and I am glad to notice that the State Board of Agriculture of New Jersey has endeavored to get an appropriation of a thousand dollars through the Legislature this winter for the purpose of sending Professor Smith, of Rutgers College, to California to collect natural enemies of the San José scale, and introduce them into New Jersey. New Jersey is now the worst sufferer from this insect, and in the absence of a State law compelling insecticide work, and with many fruit growers disinclined to undertake any such work, conditions are very satisfactory for an experiment of this kind. In the beginning of the winter I had made arrangements for a similar introduction of these insects, as well as of a supposed fungus disease which kills the San José scale, into infested orchards in Maryland, and there is a possibility that results of importance may be gained. We have already in the East many insects which feed upon bark lice, and many species of parasites which destroy them. There is no practical way, however, of bringing about any increase in the numbers of any of these species, and their work is, from a practical standpoint, not worth consideration.

The Nursery Question. — The wide distribution of the San José scale in the years following 1887, by Parry Brothers, by J. T. Lovett and his successors, the J. T. Lovett Company; by the Franklin Davis Company, Keene & Foulke, F. Boulon, Parsons & Sons, the Shady Hill Nurseries, J. A. Ramsburg, and the Cherokee Nurseries, has served to draw especial attention to the fact that for many years nurseries have been distributing bark lice and other destructive insects far and wide. In the great

majority of cases this distribution has been made unwittingly. In the case of the San José scale there can be no question of the fact that none of the nurserymen engaged in its spread had the slightest idea that they were sending out such an orchard scourge. Further, it must be said that as soon as the matter was brought to their attention, almost without exception they made every effort to stamp the insect out in their nurseries, and to stop its future distribution. The Parry Brothers, for example, destroyed thousands of young plants, and applied the best available remedies to all their remaining trees. It is certain that as a result of this occurrence, nurserymen in future will examine their stock more closely, and will be far more careful than they have been in the past, so that, after all, the introduction of this insect into the East has not been an unmixed evil. Just as there are careless, in fact criminally careless, persons in all walks of life, so there must be careless nurserymen, and under present conditions fruit growers will not be able to rely upon the absolutely clean condition of any stock which they buy. It has been suggested that every person purchasing nursery stock should demand a guarantee from the seller, — a guarantee which states definitely that the stock has at no time been infested with injurious insects, and that it is in vigorous healthy condition ; and which further agrees, that in case the stock should be found to be infested with scale insects within a certain time from the date of purchase, it shall be replaced with sound stock without cost to the purchaser. Most nurserymen would be ready to furnish such a certificate, but nevertheless this will hardly cover the case. The mere replacing of the stock is a comparatively small matter, but the purchaser will have no redress for the damage done by the introduction of such insects as the San José scale and its spread to his older trees. It is here, as in other aspects of the question, that we must look for legislative aid. The responsibility of the nurseryman should be fixed by law. His responsibility should extend not only to his own stock, but to all stock which he handles in fulfilling his contracts or those of his agents.

That the vast majority of the nurserymen of this country are alive to their own interests in this matter, and that they have either, directly or indirectly, the interests of the fruit-growing population at heart, is thoroughly shown by a resolution passed at the Indianapolis meeting of the American Association of

Nurserymen last summer. Professor Webster, of Ohio, had handled the whole question without gloves; he had shown up the part taken by nurserymen in the distribution of the San José scale in the clearest light; he had commended the frank, whole-hearted and straightforward course of the Parry Brothers, and had condemned in the most caustic manner the shiftless, evasive, not to say dishonest, actions of certain other firms. On the conclusion of this paper, Colonel Watrous, of Des Moines, Iowa, rose instantly and said, "I think that a paper that comes out and deals with our interests as fairly and as wisely and intelligently as this one, deserves a vote of thanks; and I move that a vote of thanks of this association be tendered Professor Webster for his paper, and that we approve his course." The motion was seconded and carried unanimously, and the further discussion showed that the members of the American Association of Nurserymen are heartily desirous of working for the best interests of the fruit growers, and are willing to work hand in hand with the official economic entomologists.

Legislation. — The subject of insect legislation has been brought more strongly than ever to the attention of the agriculturist and horticulturist in the East by this outbreak of the San José scale, and in New York, New Jersey, and Virginia steps have been taken in the direction of legislation against this specific insect. More than a year ago, in anticipation of an expected demand for information on the subject of legislation against injurious insects in general, I compiled a bulletin which brought together all the recent laws in the several States of the Union against injurious insects. The demand for this bulletin has been so great from agricultural and horticultural societies interesting themselves in this matter, that the small edition has already become exhausted.

The most progressive State in this direction is California. Her fruit-growing interests are so great and her climate naturally so favorable to the multiplication of injurious insects of many kinds that she naturally takes the lead in this direction. An experience of fifteen years in this work has enabled her horticultural societies to bring about a gradual improvement of the laws and regulations, until the State is at present in excellent condition to control, so far as may be, any outbreak of injurious insects, and in fact to prevent such outbreaks. Briefly summar-

ized, the State laws provide that whenever a petition is presented to the Board of Supervisors of any county signed by twenty-five persons possessing orchards, calling attention to any orchards which are affected with injurious insects, the Board shall within twenty days select three commissioners for the county, to be known as the County Board of Horticultural Commissioners. These commissioners serve three years, and it is their duty, whenever they deem it necessary, to cause an inspection to be made of any orchards, nurseries, fruit-packing houses, or salesrooms, and if they are found infested with injurious insects to notify the owner or person in charge, of the condition of affairs, and require them to eradicate and destroy the pest. If the owner refuses or neglects to abate the nuisance, the commissioners do the work themselves, the expense becoming a county charge, the sums so placed being a lien on the property from which the nuisance has been removed. The commissioners further have power to divide the county into districts and appoint local inspectors.

At the same time the State Board of Horticulture is empowered to make certain regulations covering the State work, and covering the introduction of new injurious insects into the State. Some of these regulations which bear upon quarantine provide for the inspection of all trees, plants, buds, and scions brought into the State. The quarantine officer of the Board must be notified within twenty-four hours of the arrival of such packages, which must be disinfected according to the methods laid down by the Board, upon arrival at any point where they are to be unloaded. If any of them are found to be infested with insects or fungous diseases, they must remain in quarantine fourteen days, or until the quarantine guardian can certify that they are free. Railroads are required to notify the State Board of Horticulture of the arrival of trees or plants from outside the State, postal cards backed with the blank forms being furnished by the Board for this purpose. The United States Customs officers and the Southern Pacific Railway, in particular, render the Board of Horticulture most valuable assistance. It may be interesting to quote in full the instructions of the Southern Pacific Railway Company to its agents. They are as follows :

" Agents are hereby forbidden to deliver any trees, plants, cuttings, grafts, buds, scions, seeds, or pits received from any point

outside the county in which their station is located, until such shipment has been inspected by the official duly appointed for the district in which said station is located. If no county horticultural quarantine has been authorized by the Board of County Supervisors, inspection is not required, unless the shipment originated outside of the State of California, in which case property must be held until inspected by the State Board of Horticulture.

"All agents must keep themselves fully advised of all horticultural ordinances passed, names, districts, and addresses of inspectors appointed by the county in which the station is located, and will coöperate with and follow all instructions of such inspectors, that, by joint effort of the company and the various horticultural Boards, the best interests of the State may be served."

Fruit growers in California thus have the matter of insect pests practically in their own hands, and the work of any county will be practically controlled by twenty-five enlightened fruit growers. The early adoption of any such stringent legislation in Eastern States is doubtful, but there is a growing necessity in every State for a well-framed law which may be put into operation at the outset of any threatened outbreak of an introduced or native species. Absolute safety by means of quarantine is hardly to be accomplished even in California, and in a state so well protected by its geographical situation as Massachusetts, there is by no means the same need for a rigid quarantine. A general law, however, ready to be put into operation might have saved Massachusetts many thousands of dollars in the case of the Gypsy Moth. Such a law in New York would enable efficient work against that almost equally destructive European insect now flourishing in the vicinity of New York City, the Leopard Moth; while such a law in New Jersey would enable the extermination at the present day of the recently imported pear-tree borer — an insect which, if it spreads, will render the growing of pears all through the country a much more difficult and expensive matter than it is at present. The objection to such legislation has always been the fear of possible abuse of opportunities; but the danger in this direction, it seems to me, is not worth considering compared with the danger possible, and even probable, to our horticultural interests in the absence of proper laws.

Discussion.

Mr. Howard illustrated his lecture with stereopticon slides and with specimens of all of the insects considered.

Professor Benjamin M. Watson asked, How can scale insects on small trees best be killed?

Mr. Howard replied that in California fumigation with hydrocyanic gas, under an oiled tent, is most extensively practised. In the East this treatment has not been so successful. Here we must rely mainly upon spraying.

J. W. Manning stated that in good orchards in California the insects are properly treated, but in other places they are as abundant as they are in neglected orchards in the East. He himself had seen orchards in which the Vedalia was not abundant enough to keep down the fluted scale.

William C. Strong moved a vote of thanks to Mr. Howard for his able and comprehensive lecture, which was unanimously passed.

Nathaniel T. Kidder inquired what kind of weather is most desirable for applying remedies.

Mr. Howard replied that it was all important to apply them in dry weather. Some of our best washes, notably the whale-oil soaps, act slowly and do not reach their full effect for several weeks. If there is one season of the year which more than another is apt to be dry for an extended period, that season should be chosen for the application of these washes. The long dry spell in the early winter in California is one reason for the superior action there of the lime, salt, and sulphur wash and the resin wash.

Hon. William R. Sessions inquired about the method of spread of the San José scale.

Mr. Howard stated that its natural spread was extremely slow, the young crawling but a short distance, while at forty-eight hours of age they cannot move. The spread, then, is largely accidental. The active young cling to the feet of birds and to flying insects and are thus carried from tree to tree and from orchard to orchard. The largest spread is accomplished by the commercial transportation of the insect on nursery stock and fruit. A young tree which has been badly infested for two or three years is likely to die. Very badly infested trees should be dug up and burned.

Mr. Strong thought that we need not apprehend a very general increase in scales under conditions of clean culture, such as prevail rather generally in Massachusetts.

Mr. Howard said that this remark of Mr. Strong's was undoubtedly true as regards the old and well-known scales, such as the oyster-shell bark-louse and the scurfy bark-louse, but with certain of the newer species, such as the San José scale and the West Indian peach scale, clean culture will by no means suffice.

Mr. Manning said that the *Gossyparia ulmi* or elm scale has become very common in portions of Massachusetts, and that he had seen it at Madison, N.J. He had worked assiduously to destroy it, but found it a difficult insect to fight. He had destroyed many young and thinks that his trees are now free from them.

MEETING FOR LECTURE AND DISCUSSION.

SATURDAY, February 29, 1896.

A meeting for Lecture and Discussion was holden today at eleven o'clock, the President, FRANCIS H. APPLETON, in the chair.

The following lecture was delivered on the John Lewis Russell Foundation:

SOME TENDENCIES AND PROBLEMS IN THE EVOLUTION OF SPECIES AMONG PARASITIC FUNGI.

By Professor GEORGE F. ATKINSON, Cornell University, Ithaca, N.Y.

Notwithstanding the great amount of information which we already possess concerning the development and life histories of parasitic fungi, the labor of each year adds more and more to the stock of our knowledge on the subject. There is evidently much more still to be learned before we shall be in the possession of all the facts concerning these fungi which it would be desirable to know from even a practical standpoint. The accumulating evidence of the number of species, the variation in form, the influence of environment, and their peculiar habit or adaptations, suggest that these plants are also affected by the operation of the laws of descent and differentiation, just as other organisms are.

While we can do little more than speculate on the subject at the present time, speculation is often very fruitful in the outcome,

because of the suggestions accompanying it which are often turned to good account. It does not seem out of place, therefore, at this time to point out what seem to me to be some of the tendencies in the evolution of species among parasitic fungi, and at the same time to call attention to some of the more practical problems which may be profitably considered.

Tendency toward a Wide Range in Parasitism. — One of the very striking tendencies which we see in the case of some of the parasitic fungi is that of a wide range in parasitism, so that the fungus is not confined to certain genera as hosts, nor even to the families in which these genera are located, but the range of their operations and injuries extends beyond these limits. In a sense they are omnivorous, and such species sometimes receive their specific name in recognition of the great versatility of their tastes and depredations, and their easy adaptation to a great variety of things in their gourmand-like search for dainty bits of pabulum.

The common fruit rot is a good example of the fungus appetite which rarely goes begging for some satisfying morsel. It appears to be king of rots in the case of certain of our stone fruits, like the peach, plum, and cherry. But it also attacks the pomaceous fruits, berries, etc., and finds the twigs of the peach, cherry, and other fruits palatable. As with many other parasitic fungi, its growth and the injuries which it causes are alike hastened by the prevalence of wet or moist weather. It is also much more likely to attack overripe fruit, and the fruit grower who takes the precaution to pick his fruit for shipment while it is still firm, or he who selects the hard-fleshed varieties, often checkmates this enemy. The fact that it is more likely to attack the overripe fruit or the soft-fleshed varieties, indicates that it is not strictly an obligate parasite, and that, even when it is doing much of its injury, it perhaps could not be said to be existing as a parasite, since the fruit is then in a very suitable condition to act as an excellent culture medium. It does, however, act as a serious parasite at times, and since it can adapt itself so readily to a saprophytic or parasitic existence, the question might be raised whether or not it is just now in the transitional stage, passing from a saprophytic life to a parasitic one. If this were the case we should expect that as time went on it would become more and more dependent on the host in a living condition, and that

ultimately it would pass entirely from the domain of saprophytism to the domain of parasitism.

Unfortunately we are in the dark as to the true state of things, since we have not the recorded monilia genealogy for more than a few years back. It might, perhaps, be asked with equal propriety, Is not the monilia passing from the parasitic habit to the saprophytic? Here we are also in the dark, but it would seem that what little evidence we have would tend to show that this latter suggestion could not be true of the monilia, since we should expect to find that a fungus which had been an obligate parasite on a very wide range of hosts for a long period would have developed numerous species as the hosts themselves became more and more unlike by the action of the law of evolution and variation among themselves.

If we look upon it as a saprophyte which is making its way into the domain of parasitism, its present habit of growing readily and abundantly during a large part of the season as a saprophyte would tend to prevent its lapse into distinct forms. It would be incorrect, however, not to admit that even in saprophytism the *Monilia fructigena* could exist under conditions which would tend to separate it into distinct species in the lapse of time.

The fungus of potato and tomato rot also possesses quite a wide range in the hosts which give it sustenance. It occurs not only on many of the Solanaceæ, but also on certain members of another family, the Scrophulariaceæ. So far as we know it is much more of an obligate parasite than the monilia, and according to the experiments of a late renowned investigator of the fungi, Anton de Bary, it cannot live as a saprophyte, for when the tissues of the plant have decayed the mycelium of the fungus speedily dies in those parts. Brefeld says, on the contrary, that it grows readily as a weed on various dead substances, but in his works there does not seem to be any evidence to this effect other than the mere statement. Since the eminent de Bary came to opposite conclusions, it would appear more convincing if the experiments leading to these results which Brefeld reached were given in detail.

One year ago I made quite an extended experiment, hoping to be able to grow the *Phytophthora infestans* in pure culture on artificial media, or upon sterilized potato and also on sterilized tomato leaves, which, in the living condition, form the best known

food for the fungus. While I was able to obtain the fungus in pure culture, and kept it growing in the laboratory in this condition for more than eight months, it absolutely and invariably refused to grow when an attempt was made to grow it upon dead, though sterilized, potato and tomato leaves. The growth of the fungus was obtained in the well-known way by cutting open affected potatoes during the month of January, and placing them in a moist chamber with the cut surface uppermost in a warm room until the mycelium in the tubers started to new life and appeared on the surface with the characteristic conidiophores and conidia. Rectangular blocks were then cut from fresh potatoes, rinsed in a one-tenth per cent corrosive sublimate solution, and dropped one each into a culture tube containing water previously sterilized by heat in sufficient quantity to permit of the washing off the corrosive sublimate from the upper end of the block, and to provide sufficient moisture at the bottom of the culture tube. To these blocks of potato, portions of the mycelium and conidia of the Phytophthora were transplanted, and in several of them a pure growth of the fungus was obtained, which was verified by examination with the microscope and found to agree in all respects with the fungus grown on the potato. When these blocks were well covered with the fungus, transfers were made to fresh tomato leaves sterilized by heat, as well as to potato blocks sterilized in the same way. But in all cases the fungus refused to grow on these heat-sterilized substances, though it continued to grow readily when transferred to fresh living blocks of potato.

If the fungus cannot grow as a saprophyte, then it is quite an interesting case of wide range in parasitism, with no apparent tendency to develop fixed forms on the different hosts.

Another member of this genus might be mentioned here, with which you are probably not so familiar, though it has been reported in this country, the seedling rot Phytophthora, *P. cactorum*. This has been known in Europe since 1870, and occurs on quite a wide range of hosts. Because of this de Bary gave it later the name *P. omnivora*, the specific name indicating, as you see, that the fungus is not very choice in the selection of its food. It was first described as producing a rot of species of Cactus, but it is chiefly known as the seedling Phytophthora, since it produces at times a serious rot of seedling trees, especially of the beech. The forms described on somewhat widely

separated hosts would seem to indicate that there was a tendency here to the development of forms which are characteristic on different hosts, though these are not sufficiently distinct morphologically for mycologists now to consider them different species. A vivid imagination might suggest that in times past perhaps the potato fungus was not so very different from the *Phytophthora cactorum*, or, to speak more nearly to the point, that the two were merged in one as a quite widely variable species, but that they now have become quite well separated. If this were the case it might explain the total absence, so far as we know, of the sexual stage in the *Phytophthora infestans*, *i.e.*, the conidial stage might have become so different on certain of the hosts, structurally as to produce a different and characteristic form, and biologically as to hinder it from developing the sexual stage. We must not forget, however, that the absence of the sexual stage might be given a different interpretation, and also that it may even now occur on some hosts which we have not yet examined, or under conditions which we have not yet discovered.

The white rust, *Cystopus candidus*, which attacks many of the species of the Cruciferæ, might also be mentioned as an instance of wide range in parasitism within a single family. The well-known *Puccinia graminis* has a very wide range on the grasses and grains, as compared with many other species of the Uredineæ found on the Gramineæ. Other species might be mentioned, but this number serves well to show how omnivorous some species are in their tendencies as compared with many others.

Tendency toward a Narrow Range in Parasitism. — There is, on the other hand, a tendency with some species to a restricted range in parasitism, so that so far as we know a single species is confined to but few host species, or even to but one host species. This is well illustrated by the common *Fusicladium dendriticum* and *F. pirinum*. The former, the apple scab, is one of the most common of the fungus diseases of the apple tree, especially during wet seasons, affecting the leaves and fruit, and causing dark spots by the growth of the threads and spores on the surface. The *Fusicladium pirinum*, the pear scab, attacks the pear tree in a similar way, and so nearly alike are the two fungi that there has been some question among certain mycolo-

gists whether the two fungi are rightly separated into two species. Cultural experiments will probably settle this question, and there is some evidence of this kind which goes to show that the two are distinct species. This is partly supported by the discovery of what is supposed to be the perfect stages of these fungi, since the form in which we knew them on the apple and pear is what is called the "imperfect," or conidial stage.

Brefeld cultivated a species of *Venturia*, which he called *V. ditricha piri*, and from the ascospores he succeeded in developing a conidial form which bore such a strong resemblance to the *Fusicladium pirinum*, that he considered the *Venturia* to be the perfect or ascosporous stage of the pear scab. Aderhold, in 1894, found another species of *Venturia*, *V. chlorospora mali*, on apple leaves, from which he grew a conidial form very nearly like the *Fusicladium dendriticum* (the apple scab). Then he recounts also how he was able, starting from the fungus of apple scab taken from the leaves of the apple, to grow the conidial stage in artificial media and also to develop the venturia stage, which would be pretty good evidence that the venturia is the perfect stage of the apple scab. We should also expect to find that a venturia is the perfect stage of the pear scab, and this perfect form Aderhold hoped to find in the *Venturia ditricha piri* of Brefeld. But in searching on pear leaves for this species of *Venturia* he found both *Venturia ditricha piri* of the pear, and also *Venturia chlorospora mali* of the apple, and this has prolonged the investigation. But if the apple and pear scab should be found to be one and the same species — and I do not anticipate that this will be the case — still the parasitism would be quite restricted in range as compared with the species above enumerated. It is quite in accordance with the theories of descent that at least in the remote past a single species of Fusicladium combined the characters of the now two species, or at least possessed the inherent tendencies which have resulted in the evolution of these two forms.

Many of the species of the genus *Sclerotinia* exhibit well the tendency to a narrow range in the parasitic habit, as the *Sclerotinia vaccinii* Wor., on *Vaccinium Vitis-Idæa*; *Sclerotinia Oxycocci* Wor., on *Vaccinium Oxycoccus*; *Sclerotinia baccarum* Schroeter, on *Vaccinium myrtillus*; *Sclerotinia megalospora* on *Vaccinium uliginosum*; and others. On the other hand, one

species has quite a wide range, the *Sclerotinia libertinia* F'kl., which we know in this country as frequently producing diseases of forcing-house plants, causing decay of the stems, and then developing small black bodies of fungus tissue called sclerotia.

Tendency toward the Exclusion of Forms from the Life Cycle. — Another peculiarity in the tendency of certain fungi is that of the exclusion, or shutting out of forms, or stages from its life history. A good illustration of one of these fungi is seen in a sterile fungus which I have frequently found to be the cause of damping off of seedling plants, it being often a more common agent in the production of this disease than the *Pythium debaryanum*, which has often been spoken of as the sole cause of this trouble. I speak of it as a sterile fungus because in my experience with it during several years from several different states, I have never been able to find or to produce in artificial cultures any recognized fruiting form. According to peculiarities of its development it would be classed by some under the form genus *Rhizomorpha*, when it develops slender rope-like strands by the parallel interlacing of its threads, or under the form genus *Sclerotium*, when it develops these characteristic bodies.

It is enabled to propagate itself by the breaking up of short moniliform threads on the surface of the sclerotium, the separated segments of two or more cells functioning as conidia, while the sclerotia act as resting bodies to tide the fungus over unfavorable periods for its growth. We cannot say that it has no other form in nature, and probably some form of true fructification is developed at some time, though this is not necessary. As compared with many other forms which quite regularly develop their characteristic fructification, there is a very decided tendency here to the loss of that form if that has not already taken place. The plant at one time undoubtedly had a fruiting form. It may by this time have lost it, or it may have become so changed that in this vegetative condition it practically represents, either biologically or structurally, an entirely different species from its immediate ancestor, and thus has no complemental fruiting form into which it could pass in order to complete its development.

Some rhizomorphs, it is true, have been found to be vegetative states of some member of the mushroom family, the so-called

ozonium, for example, or the rhizomorphs which are connected with the *Agaricus melleus*.

There is no doubt a tendency in a vast number of species to eliminate, or to become permanently separated from, some one-time complemental form. Many of these are represented in the so-called "imperfect fungi," and one or more of our common species of *Botrytis* at least exhibit a tendency in this direction, if they have not already become permanently divorced from the complemental peziza form. One of these, *Botrytis vulgaris*, is especially abundant in forcing houses, attacking nearly all kinds of plants, and growing indifferently as a saprophyte or as a parasite, though perhaps more frequently as the former. It is well known by its conspicuous fuzzy growth on the surface of the affected parts of the plants as it matures its conidia. The mycelium, which is profusely branched and septate, grows in the tissues of the attacked plants, penetrating the cell walls and causing a soft rot of the tissue. From this mycelium the erect conidiophores, or fruiting threads, arise through the epidermis, and at a little distance from the surface produce quite a number of short divergent branches, which bear near the ends oval conidia in such a crowded condition that they appear to form small heads. At first this fuzzy growth is colorless, but with age it becomes grayish-white or grayish-brown in color. Besides the peculiar grappling organs which it develops, and which are said to excrete a ferment that dissolves the cellulose of the host plant at the point of attack, and thus to aid the fungus in gaining an entrance to the tissues, there are developed in artificial cultures, on suitable media, numerous black sclerotia composed of compactly interwoven fungus threads.

I have on repeated occasions seen these develop, especially on sterilized bean stems, or other sterilized plant tissue, in great numbers. Several times an attempt has been made to grow a perfect form from the sclerotia, but always with negative results up to the present time. The sclerotia probably need a period of rest, and this period has been given for several months on different occasions, and when the sclerotia were planted on moist sand they invariably developed the well-known conidiophores of the botrytis form which appear on the diseased plants. Perhaps the period of rest for the sclerotia has not been sufficiently prolonged. I have sclerotia now which are more than one year old,

and the action of these ought to throw some light upon the doubtful history of the fungus. Some have confidently asserted its connection with the *Sclerotinia libertiana*, which also occurs in forcing houses, and we should expect that if it does develop an ascosporous form it would be of the sclerotinia type. But that the connection has been properly established there seems room for doubt, since the sclerotia or the mycelium of the *Sclerotinia libertiana* do not develop the conidiophores, nor have the conidia of this ascosporous form been observed except on the evidence of the doubtful connection of the *Botrytis vulgaris*.

This would seem to show that the botrytis was at least nearly, if not quite, separated from the sclerotinia form. From present conceptions of the descent of the group of the Ascomycetes we must accept the view that the botrytis at one time had such a form, or that it is descended from some other botrytis form possessing a sclerotinia stage, by differentiation in the conidial form only. This it seems to me is a perfectly natural process in the evolution of forms which are restricted for long periods to only one of their phases of development, and it appears probable that it has prevailed to a very great extent in the Hyphomycetes and Sphæropsideæ.

Several of the form genera which produce the diseases of plants known as leaf-blight and leaf-spot, like *Cercospora*, *Septoria*, *Phyllosticta*, *Phoma*, etc., probably contain numbers of species which do not have any complemental perfect or ascosporous form. It is true that in several cases the perfect form has been pretty certainly determined. We might cite as illustrations, the black rot of the grape (*Carlia bidwellii*), strawberry leaf-blight (*Sphærella fragariæ*), leaf-spot of the quince and pear (*Entomosporium maculatum*), cotton leaf-blight (*Cercospora gossypina*), etc.

The perfect stage of the black rot fungus has been rarely found, and then on dead parts of the grape, as the dead berries which lie on the ground during the winter. The phyllosticta form, which attacks the living leaf, stem, and fruit, and becomes a true parasitic form, is very wide spread and common. Quite likely it does not need the perfect form as a means for its perpetuation, since the leaf-spot usually begins earlier in the spring than the development of the ascosporous form, the pycnospores being able to live through the winter, probably in protected

places, as in the crevices of the bark of the vine or in similar crevices on the trellis.

The same is the case with the strawberry leaf-blight, the ramularia stage being the form which produces the disease, while the perfect form, the sphærella, is developed in the dead spots of the leaf, probably late in the season, or during the winter or in the spring. Even here it is not necessary for the continuation of the fungus in the ramularia form, for there are stromata or rudimentary sclerotia developed from the mycelium on the diseased spots, which live through the winter and are able the following spring to develop a crop of the conidia while the sclerotium is lying on the ground. Thus the disease is started anew for the season without the intervention of the sphærella form, and this probably happens in a great majority of cases, since the sphærella stage is rarely collected.

So with the leaf-spot of the pear and quince. The parasitism is brought about by the imperfect form, the entomosporium, which causes small brown spots on the leaves, of a nearly circular outline, with darker minute elevated pustules containing the conidia. These become ruptured in an irregular manner and set free the insect-like conidia. On the fruit it causes irregular blackish spots which check the growth of the fruit tissue at these places and may cause it to crack. The perfect form of the fungus, which Sorauer calls stigmatea, develops on the fallen leaves during the winter and the following spring. But it is not necessary as a means for bridging the fungus over the winter period, even though the ascospores mature early enough in the spring for an infection of the leaves from that source, since the entomosporium spores also live through the winter on the fallen leaves, or are developed in the pustules which have hibernated, and the infection can take place from them as well.

The leaf-blight of cotton has a similar history, the parasitism arising from the imperfect form, or rather the conidial form, being the one which appears on the living leaves, while the sphærella form develops on the dead fallen leaves. Whether the cercospora form of the cotton leaf-blight can live through the winter has not been determined, but it is likely that it can.

Besides a few instances in which the perfect forms are known, there are a very great number of the imperfect forms which have not been connected with a perfect form. It is true that the

number of fungi which we know in the perfect form is very large, even in some of the genera which have been shown to be the perfect stage of some of these imperfect fungi, and also that some of these are even to be connected with others of the imperfect fungi if we could only be fortunate enough to trace out their life history. But many of them are found under conditions which would probably preclude their being connected with any but a few of the known species of the imperfect fungi, unless the phenomenon of heterœcism (growing on different hosts during different stages) has a very much wider application in nature than there has as yet been any hint of from authentic sources. One well-authenticated case of heterœcism outside of the Uredineæ is found in the species of *Sclerotinia*, known as *S. ledi* Nawaschin, which has been found by Woronin and Nawaschin to have its conidial form on *Vaccinium uliginosum*, while the sclerotinia form is developed on *Ledum palustre*.

In many of these imperfect forms there is a sort of physiological dimorphism existing between the parasitic imperfect form, as we have seen, which grows on the living parts of the host, and the perfect form, which we have seen grows on the dead parts of the same host. It appears as a parasite in one case and as a saprophyte in the other. This property of growing as a saprophyte suggests that in some cases the perfect form may grow and produce its fruit on other material than that of the same host on which the imperfect form may develop, since in artificial cultures many of these fungi will grow well on several different substances, which in one sense would be a sort of heterœcism. In other cases it is equally probable that the perfect form, even as a saprophyte, does not depart widely from the path of its host in its development.

One very interesting and important peculiarity lies in the fact that in many of the fungi belonging to the great group which we now have under consideration, each of the complemental forms may develop and multiply quite independently of each other. We have seen how by the intervention of stromatic bodies or sclerotia, or even by the conidia themselves, imperfect forms may live through the winter or during other unfavorable periods for their development and may start the disease and the course of their development entirely independently of the perfect form; or the mycelium may live in the adjacent tissues of the diseased

woody stem, the fungus being in fact perennial in the imperfect form.

A number of the perfect fungi reproduce the ascosporous form during numbers of successive generations without the intervention of a conidial or pycnidial form. In the case of the imperfect forms which are parasitic while the perfect forms are saprophytic, while I have not in mind now any species[1] in which the ascosporous form reproduces itself successively as a saphrophyte without the intervention of the imperfect form, I do not doubt that there are a number of instances of such behavior.

This peculiarity of the imperfect forms developing from year to year quite independently of the perfect form has probably led to a differentiation of the conidial stages of many fungi to an extent which has carried some forms quite beyond the possibility of their ever passing into the perfect form again. By this I mean it is quite possible that following the tendency to vary and produce forms which are regarded as different species, combined with the habit of reproducing their own form from year to year, such physiological as well as structural peculiarities may be evolved as to so change them that they could not develop an ascosporous form without an abrupt reversion or the sudden evolution of a new species of the perfect form.

During this process of differentiation of the imperfect form into a great number of species, the ascosporous form would probably for a time serve as the bond connecting all the forms through which they would now and then pass. But from the quite independent life and development of the imperfect forms some of them would probably become so far changed that the bond would no longer serve to show that they were all of one stock, and we should have species of the imperfect fungi evolved, which become entities in themselves. In such cases we could not hypothetically say that there existed some other stage in which the fungus passed the winter, or some perfect stage which carried it over unfavorable periods, and that the discovery of this perfect form was indispensable to the complete understanding of the relation of the fungus to the particular disease in question and to its etiology.

Such is probably the case in many of the parasitic species belonging to the form genera *Glœosporium*, and *Colletotrichum*,

[1] Certain species of Teichospora and Ceratertoma do in artificial media.

which cause the diseases known as anthracnoses. While there are probably groups of species included in these form genera, which if they have a perfect form would be found to belong not only to different genera of ascomycetes, but even to different families of fungi, there seem to be species so closely allied that together with the fact that they can in one way or another pass the winter or unfavorable periods for growth, they suggest a like origin from the same perithecial form. The colletotrichum of the bean can live in diseased seed beans and start the disease anew when the seedlings begin to grow. The cotton colletotrichum lives on the seed, either by the vitality of the conidia or from stromatic bodies, so that the disease can be originated at the beginning of the season by simply planting seed which comes from diseased bolls. In the case of the glœosporium of the privet, *G. cingulatum*, the mycelium is perennial in the diseased stems, and breaks out on the advent of spring again. In many of the species stromatic bodies are developed which would assist them in hibernating.

Artificial cultures of certain of the polymorphic fungi belonging to the Pyrenomycetes show that at least under these conditions imperfect forms are usually slow to develop a complemental ascosporous form, though this is by no means general, while the ascosporous form can usually quite readily be grown into the conidial form. Some cultures which I carried on with *Nectria cinnabarina*, a very common fungus found on a great variety of twigs and dead limbs, and by some supposed to be quite a serious parasite at times, illustrate this. The culture was started from the ascospores of the fungus found on dead stems of sambucus (elder). Sown in nutrient agaragar the ascospores germinated, but grew slowly, forming small colonies by the side of large ones of different saprophytic fungi which appeared in the culture. On transplanting some of the colonies to sterilized bean stems in culture tubes, the characteristic stroma and conidia of the tubercularia stage appeared, but after keeping the cultures for nearly a year and making several transfers, no ascosporous form appeared. I would not infer from this that the perfect form could not be produced from the imperfect form in artificial cultures, for I believe that it could if advantage were taken of the right conditions. But it is a difficulty which has been encountered by others, and in the case of other species, and shows probably in nature also, so far as we can judge from observation, that the

ascosporous form of polymorphic fungi passes more readily into the imperfect form, than the imperfect form passes into the perfect form in many cases.

Tendency toward the Inclusion of Forms in the Life History. — As opposed to the shutting out of forms in the evolution of species there is a tendency among some to the inclusion of forms. This is an accompaniment of the increasing polymorphism of certain fungi, or in the increase of forms in a given species of fungus. By the increase in the number of forms in which a fungus can grow and multiply, it increases its power in the struggle for existence. Some of these additional forms in certain species are probably either developed as a result of the tendency of the same species to cut off an earlier form so that this new form may take its place in tiding it over unfavorable periods for its growth, or in making more certain the perpetuation of the fungus in the imperfect condition. The incipient stromata of many species, as well as the sclerotoid bodies, segments of the mycelium which acquire a thicker wall and a change in the condition of the contents so that the protoplasm is more resistant, gemmæ, and many bodies of these and similar kinds, which in many species take on more or less the form, and certainly the function, of conidia, may be enumerated as coming under this head. A very interesting case is that of the *Monilia fructigena*, which causes the rot of many fruits. Under certain conditions there is developed in this species an aspergillus-like form of fruiting.

Tendency to a Fluctuation in Virulence. — The tendency to a fluctuation in virulence in certain species is a point which would repay careful investigation. This tendency is probably better known in the case of many bacteria than in the fungi. Races of bacteria can quite easily be developed under artificial conditions which are more or less permanent, according to the length of time that they are subjected to the special treatment or conditions. These races may show peculiarities of form, physiological peculiarities, or peculiarities in virility as parasitic germs, and partly upon the attenuation of the virility of certain species does the theory of preventive inoculation rest.

The common botrytis, which has been mentioned above, is an illustration of this tendency in certain species of fungi. Under some conditions it exists in our forcing houses on the dead or

decaying parts of plants, and for a long period produces no serious harm, but again it gains such a foothold at times on certain plants, that nothing short of the destruction of the host will stop its course. For several years I have been interested in watching the habits of this fungus, and many times have been constrained to look upon it as a harmless accompaniment of other disorders ; and usually, I think, this is the case. But the present winter some potted roses came under my observation showing at first a few leaves which had been damped off by the fungus. Gradually the mycelium invaded the more permanent tissues of the rose stems until all parts of the plants were so thoroughly infested with the parasite, and so badly disorganized in places, that it is doubtful whether they could ever recover. De Bary has shown how the mycelium of the *Sclerotinia libertiana*, after it has been aroused to activity by growth on the dead parts, is enabled successfully to attack the living ones.

This tendency is of course in many cases largely governed by environment and the physiological condition of the host, but the fungus makes use of these conditions, and for the time is enabled by them to set such a pace of parasitism, that plants are more easily invaded which would otherwise escape injury.

Adaptation to New Conditions. — Close to this tendency to fluctuation in virulence is the tendency toward adaptation to new conditions. This can be easily demonstrated in the case of some species when attempting to grow them in artificial media. For several years I have been attempting at various times to obtain a culture of the leaf-spot of the quince and pear. Several times the fungus has been found to germinate in nutrient agar, but in no case would it develop more than a few short threads in this medium. The spores, after having been transferred to sterilized pear fruit in culture tubes or to sterilized bean stems, showed no signs of growth until after about three weeks, when a minute tuft of mycelium could be observed at the point where the spores had been transplanted. In the course of two or three weeks more numerous spores characteristic of this fungus were present, and the mycelium was quite well developed. In making new transplantings from these spores to fresh sterilized bean stems, a new crop of spores and well-developed stromata were present in a little more than two weeks, and on transplanting the spores from this second crop to fresh culture tubes of the same

medium, the third crop of spores was developed in a little more than one week. Now the fungus grows abundantly and quickly as a saprophyte in artificial cultures.

The nitrifying organism (a bacterium) studied by Frankland presented similar peculiarities in the attempts to grow it in artificial culture media, and there was also a change of form in the adaptation to new culture media.

Other cases might be cited of like adaptations, and they lend some support to the statements that certain fungus parasites of one region when carried to another sometimes acquire a rapidity of development and adaptation to the new conditions on new varieties of hosts, which makes them more virulent than in their native land and condition. It also suggests that certain species of fungi may pass slowly from feral plants to cultivated ones, and when they become adapted to the new conditions may, from the numbers of the host, and perhaps the lack of certain hindrances which existed in the feral state, as well as the more artificial physique of the host, become serious pests.

Fluctuation in Seasonal or Polymorphic Forms. — There is also a fluctuation in seasonal forms, if they may be so called. De Bary notes that *Peronospora alsinearum*, one of the downy mildews, in the neighborhood of Strasburg, in the spring develops conidia which are accompanied or immediately followed by the oöspores on the same host, while in the autumn only the conidia are developed. A fluctuation of this kind, or in the appearance or omission for a greater or lesser period of certain phases of many of the polymorphic species, may account for the varying notions as to what phases or stages appertain to certain species of fungi. Yet it would not do to admit, without careful investigation, the inclusion of forms which have been seen to accompany well-determined stages in the life history. Perhaps it is not yet definitely established just what forms belong to the black knot fungus of the cherry and plum.

Periodicity in Development. — Among other tendencies we may inquire whether there is not a tendency in some species or groups of fungi to a periodicity in the development — a periodicity I mean which would require two or more years in the completion of its round. I do not mean a periodicity which requires several years for the development of the vegetative phase of the parasite before the fruiting occurs, but a periodicity similar to

what occurs in the case of the bearing of some fruit trees, where a tree which has been permitted to bear very heavily one season will usually bear but little fruit the next year, and so a sort of alternation sets in, fruiting years being followed by years of scanty fruit. It has seemed to me at times that the fluctuation which sometimes marks the appearance one year of fungi in great numbers, and then a scanty appearance the next year, might find an explanation in a sort of periodicity. Climatic conditions undoubtedly play a most important part in the periodicity of many of the great fungus attacks, especially of those fungi which are dependent on a new infection of the host from year to year for their propagation. The perennial species of leaf curl and plum pocket sometimes are very abundant one season, and then the next season are comparatively rare. Two years ago the specimens were very plentiful, and the following year I made preparations for a harvest of the species in an early stage of development, but it was almost impossible to obtain any material. It seems strange that climatic conditions should be solely responsible for the great abundance one year and the scanty appearance the following year. Can it be that the mycelium one year largely spends itself in the production of the fruiting form so that there is comparatively little mycelium left in the buds of the tree or young tissue, and that the following year the energy of the fungus is largely devoted to the replenishing or building up again of a stock of the vegetative portion, so that with the opening of the buds the next succeeding year it can advance to the fruiting condition rapidly and abundantly?

Variation in Form. — In many fungi there is a tendency to a great variation in form and habit in what is recognized as a single species. This tendency to variation in form in the case of certain species makes it exceedingly difficult in some other cases to determine just the limits of the species. Certain species of the Uredineæ, as *Puccinia heterospora*, and *P. pruni-spinosa*, vary either in the number of cells in the spore or in the marking of the spore. In the form genus *Cercospora* there is very great variation in the length of the conidia, even in a single species, so that there is some uncertainty at times as to whether this variation is due only to meteorological conditions or to a specific difference in the fungus in question. Again, in the group of fungi known as the powdery mildews, there is the species

Podosphæra oxyacanthæ, quite common on certain cherries and other species of the genus *Prunus*, which has been considered by some to represent several different species, according to the number and position of the appendages of the perithecium. In the genus *Microsphæra* there exists one of the great mycological puzzles as to just what the species *Microsphæra alni* is, so variable and so intergrading are many of the forms which have been considered distinct species by some. Some of these variations in form are concomitant with the occurrence of the fungus on certain host species, and the host species in some cases has served as the only criterion for the separation of forms. Some go so far as to include in this *M. alni* all forms of variation within certain limits on all hosts except the oaks, drawing the line at the genus *Quercus*, while it is impossible from purely morphological characters to separate most of the forms on the oaks from this generalized concept of *Microsphæra alni*.

Tendency toward Fixity of Form. — On the other hand there is a tendency toward a fixity of form and habit in some fungi. Many of the members of the family known as the Smuts, the Ustilagineæ, are, partly from the simplicity of their spores, limited to very slight variation of form. This is well shown in the case of the oat, wheat, barley, and other smuts. Judged simply from morphological characters the variation in form would not seem sufficient to warrant the separation into so many species as are now accepted. Cultures, however, which have brought out differences in the course of development as well as in the confinement to distinct hosts have shown that species are to be maintained where forms were formerly alone accepted. It is quite within reason that at one time several of the species now considered separate were one species, with variations including nearly or quite the limits of the differences exhibited by the species at present, and that now certain of these characteristics have become fixed along with the confinement of the form on a single host.

Physiological or Biological Forms. — Perhaps one of the most interesting tendencies is that in the direction of the evolution of biological or physiological forms of a given species. These are forms which could not be detected from a purely morphological standpoint, but are determined by the study of the relationship of the species to its various hosts.

Some recent experiments in the culture of the Uredineæ by Eriksson, Klebahn, and others, show that some species of rusts which are indistinguishable in form and which have quite a wide range in parasitism, have become separated into biological forms, the forms being confined to a narrow range of hosts in the number of those ascribed to the species as a whole. For example, in *Puccinia graminis*, the common wheat rust, which occurs on the grains and many of the grasses, there are several form species, which are shown to be quite certainly fixed, while there are others which are not so certainly fixed.

In *Puccinia graminis* three forms have been determined which are considered fixed; one form, *secalis*, on what might be called the rye group, since it occurs on *Secale cereale* (rye) and also on *Hordeum pratense*, *Triticum repens*, and *Elymus arenarius;* a second form, *avenæ* on the oat group, *Avena sativa*, *A. elatior*, *Milium effusum*, *Alopecurus pratensis*, and *Dactylis glomerata;* and a third form, *airæ* on a single species of grass, *Aira cæspitosa*. Two other forms which are considered fixed have not been certainly determined. They both occur on certain species of grasses. Still another form occurs on wheat which is not considered fixed.

These forms were determined by cross inoculations with uredospores upon the different hosts, so that uredospores from any member of the rye group would not infect any member of the oat, aira, agrostis, or poa group, but would infect any member of the rye group. Likewise, uredospores from any member of the oat group would not infect any member of the other groups, but would infect any member of the oat group. The wheat form was found not to be fixed, since infection in a few instances took place with uredospores from both the rye and oat group. This fact is looked upon as indicating that the form on wheat is the original one from which all the others have been evolved, and that it retains even at the present time some of its original plasticity.

Another interesting result of these investigations is the fact that the puccinia spores from any of the groups can be used to produce the æcidium, or cluster cup stage, on the barberry, but the æcidiospores from the barberry which were developed from the rye group would not work on the oat group, while they would work on any member of the rye group; similarly æcidio-

spores from the barberry which were developed from the oat group would not work on the rye group, while they would work on any member of the oat group.

Similar form species were found in the case of several other Uredineæ which were investigated, and it would not be surprising if similar specialized forms of species were to be found throughout the entire range of the more strictly obligate parasitic fungi.

Problems. — These are some of the tendencies which I believe are manifested in a greater or lesser degree in the evolution of species among parasitic fungi. It must be admitted that in many instances we have indulged largely in speculation, but there is, I think, reasonable ground for speculative discussion upon these tendencies. We might regard them as to some extent hypothetical, and thus they would serve to indicate some of the lines on which investigation might profitably be carried further on, for the solution of these questions would throw a great deal of light on the treatment which should be given or recommended for the prevention of the fungous diseases of many of our cultivated plants.

A number of the problems connected with the subject are suggested in the discussion of the various paragraphs, and the solution of these questions requires not only the investigations of the mycologist, but also of the practical fruit grower. Prophylactic treatment, no doubt, must be depended on in a great many cases; but in many others by careful attention to the breeding of healthy, stocky, and resistant varieties of fruits and other plants, to this extent we shall be able to dispense with the knapsack sprayer.

The number of varieties noted for productiveness and for fruiting at opportune seasons is one of the wonderful achievements of the horticulturist and florist. While hardiness is also a characteristic of some of the new productions, it would seem that less attention had been given to this very important quality in planthood than to other points. One of the important problems is the development and fixing of disease-resistant varieties, as well as the general well-being of plant life, and the setting of a wholesome environment to counteract the tendencies among plant enemies which the absence of these qualifications in plant culture is promoting.

One of the encouraging signs of progress in the war upon fungous enemies of plants is the enlightened action by which many horticulturists, as individuals and as organizations, are profiting from the results of scientific investigation. Not only is this so with regard to direct prophylactic treatment, but especially in the general tendency toward improvement in methods of propagation, culture, handling, and environment, which are applied to the management of the fruits that minister so largely to the comfort and happiness of life. These are the coast defences and the methods of diplomacy by means of which threatened invasion is averted, and by means of which the life of our plants and the sources of revenue are preserved.

Discussion.

Before the lecture commenced printed slips were distributed which contained a brief abstract of the paper.

President Appleton complimented the lecturer on the interest and value of his paper, and asked whether any attempts had been made to destroy insects injurious to vegetation by means of parasitical fungi.

Professor Atkinson replied in the affirmative, first saying that the families of such fungi were different from those which attacked plants, and citing the case of the attempt in the West to kill chinch-bugs by means of *Sporotrichum globuliferum.*

Professor A. B. Seymour asked whether the cluster-cups, produced upon the barberry by the specialized forms of *Puccinia graminis,* differed from each other and from those produced by the type, intimating that they might be true species.

Professor Atkinson answered that more investigation was needed before those matters could be determined.

President Appleton inquired in regard to the possibility of cultivating the parasitical fungi which attack insects.

Professor Atkinson replied that these matters are now attracting the attention of investigators. It is claimed that the cultivations of *Sporotrichum globuliferum* which have been sent to the farmers have done great good; but these questions are by no means settled.

BUSINESS MEETING.

SATURDAY, March 7, 1896.

An adjourned meeting of the Society was holden today at eleven o'clock, the President, FRANCIS H. APPLETON, in the chair.

The Secretary being absent by reason of illness, the President appointed Miss Charlotte M. Endicott Secretary *pro tem.*

On motion of Joseph H. Woodford it was voted that on account of its length the report of John G. Barker, as Chairman of the Committee on Gardens, be referred to the Committee on Lectures and Publication without reading.

The following named persons, having been recommended by the Executive Committee, were on ballot duly elected members of the Society:

ROBERT CAMERON, of Cambridge.
VIRGIL C. GILMAN, of Nashua, N.H.
THOMAS HARRISON, of Melrose Highlands.
WILLIAM F. DREER, of Philadelphia, Pa.
J. W. HOFFMAN, Ph.D., of Tuskegee, Ala.
Miss AGNES W. LINCOLN, of Medford.

Adjourned to Saturday, April 4.

MEETING FOR LECTURE AND DISCUSSION.

SATURDAY, March 14, 1896.

A meeting for Lecture and Discussion was holden today at eleven o'clock, the President, FRANCIS H. APPLETON, in the chair.

The following paper was read by the author:

ORNAMENTAL PLANTING FOR PARKS AND PUBLIC GROUNDS.

By WILLIAM S. EGERTON, Superintendent of Parks, Albany, N.Y.

In response to an invitation extended by the Massachusetts Horticultural Society to read a paper on "Ornamental Planting for Parks and Public Grounds," I have prepared the following brief summary of the "Theory and practice of ornamental planting, as applied to suburban parks and city gardens or greens." It

is impossible to cover so broad a field in a brief paper; my aim has been simply to outline the scheme of work; to suggest the lines upon which natural, pleasing effects can be secured, without entering into an elaboration of detail and technicalities that would expand this paper to unwonted limits, and possibly confuse my hearers.

A number of standard authorities have been drawn upon to facilitate the preparation of this paper, but the subject matter is largely the reflection of an extended experience in landscape gardening and the maintenance of public parks.

The use in America of the word "park" as a general designation for gardens, green courts, and all sorts of public places, is an exaggeration of a French application of the word to the more private or kept grounds of a chateau connected with a forest.

Open spaces for public use in a city may be termed "places;" grounds in turf and trees within places, "place parks;" and broad thoroughfares planted with trees and designed with special reference to recreation as well as for common street traffic, "parkways." A park, as defined by Mr. Frederick Law Olmsted, "Is a place for the enjoyment of rural scenery in a sense that a garden, for instance, is not. A town park is a place of escape to such scenery, from scenery of a town-like or artificial character. The circumstance that distinguishes a park, therefore, is that of seclusion. All parks, properly so called, are surrounded by screening plantations, and it is a leading motive in their design to shut out of view, to those to be benefited by them, whatever might be unfavorable to a continuous impression of consistent sylvan scenery." In a word, to shut off from those within the park a view of such features of a town-like character, as absolutely define the limits of a park and take away the deceptive and pleasing effect of its uncertain area.

The fundamental elements of any large park are not its roads, walks, bridges, buildings, and other accessory features requisite for the public accommodation in the use of the grounds. These may rather be classed as necessary evils. The essential element is the landscape, its surface undulations of hill and dale, or lawn; its trees, shrubs, single or in mass, in grove or copse; its deep woods or open glades, and its broad stretches of greensward or water. All of these elements in their endless combinations are constantly modified by the varying conditions of the point of

view, the atmosphere, and the seasons. The true ideal of park recreation, to persons worn by the harassing turmoil of city life, is the refreshing enjoyment of all that may be seen and felt amid the placid manifestations of nature embodied in the landscape.

There is nothing really different in the general theory of landscape gardening as applied to the ornamentation of parks from that theory as applied to ordinary grounds. The apparent difference lies in the special application to some particular individual undertaking.

In actual practice one park must be treated differently from other parks, this difference of treatment being dictated by the situation, surroundings, and topography. No general plan can be outlined that would suit the demands of every locality. The general idea and keynote, however, to most successful examples of park construction in this country (and there are no better examples abroad) is the simple and natural effects, or meadow-like stretches of lawn, circumscribed or bounded by ornamental plantations properly distributed and massed. The main repose and highest enjoyment of parks reside chiefly in these spots.

The sense of quiet repose ministered to by a large lawn surface is not satisfied by picturesque ground, however vigorously it may be planted, and as the need for quiet repose in this workaday world is more constant than the need for vigorous stimulus, a lack of pastoral, meadow-like stretches of lawn in a large public park will always be felt by the habitual visitor to be a serious disadvantage.

As a general rule each element in the scenery should be simple, natural, and unobtrusive, so that the passing observer is impressed with the manner in which views are successively opened before him, through the innumerable combinations in which the individually modest elements constantly rearrange themselves — views which often possess every quality of complete and impressive landscape compositions.

The aim should be to produce the park, rather than the more elaborate pleasure-ground or garden style of scenery, not only for the reasons above indicated, but because a ground of this character can be consistently and suitably maintained at much less cost; because, also, it will allow the necessary conveniences for the enjoyment of it by large numbers of persons to be introduced in such a way as not to be unpleasantly conspicuous or disastrously

incongruous; and because it favors such a distribution of those who visit it that few shall be seen at a time, and that the ground shall not be overcrowded.

"A landscape in order to be beautiful must have all its parts stamped with a common idea, and contributing to a single sensation. If it gives the lie here to what is said yonder, it destroys itself, and the spectator is in the presence of nothing but a mass of senseless objects."

The north meadow in Central Park, New York, has an area of nineteen acres; this area is greatly exaggerated to the observer by the judicious arrangement of the planting, opening up long lines of sight, and broadening here and there into large expanses of turf. The sheen of the grass, the varied tints of the foliage, the low-lying hillocks crowned with large forest trees, the great bowlders entirely exposed or only half buried, the meadow beyond running back to seemingly unknown distance, — all contribute to make the picture one of pastoral beauty. There is dignity, there is breadth, repose, restfulness, and yet a sense of isolation that is not absolute. It is genuine park scenery that the eye is tempted to linger on and the foot to walk on, and it presents, if reviewed as a single feature, one of the best examples of good park work.

The same general features have characterized the work of a master-hand, in the long meadow of Prospect Park, Brooklyn, and will be secured in Franklin Park, Boston, when completed, and time has matured the growths and mellowed the crudities of the site.

The landscape gardener must take into consideration all the impressive and natural elements of the locality, in the planting of any park of sufficient extent to have a distinctive landscape character. The general aim of his work will be to make a harmonious combination with the dominant characteristics which nature has already stamped upon the site. He will seek a fuller or richer development of the essential leading features, simply softening what is hard, clothing what is bare, filling out what is meagre, and enriching what is beautiful, — all in harmony with the original type.

He will thus avoid all novel conceits, all conspicuous eccentricities, all incongruous intrusions, and be guided by his understanding of the laws of nature and his sympathy with them. It

is a common practice to value the decorative work in planting, on any given site, in general proportion to the degree in which it is obviously artificial, new, or peculiar. Thus clumps of trees and shrubs, or beds of flowers and foliage plants, are located in conspicuous places, without fitting relation to the natural conditions of the landscape.

What is needed, therefore, is popular education with respect to the beauty, adaptability, and arrangement of the component parts of successful design in landscape and gardening work.

There are fully one thousand different species and varieties of ornamental trees and shrubs, besides great numbers of hardy flowering plants, all possessing distinct features of beauty, that will thrive in the greater part of the United States. It is an intimate acquaintance with the habit, growth, and ultimate development of the greater part of these that insures to the landscape gardener success in selecting, planting, and grouping the varied specimens, so as to combine all the essential elements, in form, foliage, and color, of a pleasing landscape. The lack of such an acquaintance with the varied characteristics of planting material is one of the most fruitful sources of failure in planting our parks and public grounds.

In employing trees and shrubs for ornamental planting, such a selection and arrangement should be made as will, for the number used, insure the greatest possible degree of beauty and interest attainable.

In a study of natural landscapes, it may be observed that trees, shrubs, and plants bear relation to each other:

First, in the form of groups and thickets, or dense woods.

Second, in open or somewhat scattered arrangements.

Third, as single, isolated specimens.

Fourth, as being wholly absent in places.

The partly open feature of a landscape is most essential, if we would have beautiful parks or public grounds. This treatment affords an opportunity for viewing the grounds at varied points; for admitting cool breezes and sunshine; for the effects of light and shadow; and, most important of all, that degree of general repose and breadth, without which no park or public ground of any extent can be altogether satisfactory. The prevailing idea in planting would seem to suggest the bringing together such specimens of trees or shrubs as possess contrasting qualities;

arranging these group against group, with a slight scattering of individual specimens here and there, but all done for making the distinguishing and often strongly marked characteristics of one kind relieve and offset those of others, without, however, too great contrasts in color.

Often a single native tree, with ample space for complete development, will, by its form and color, accentuate and bring out the contrasting features of other neighboring growths, as single specimens of our native oaks, maples, ashes, and dogwoods emphasize and bring into bold relief the sometimes sombre tints of our native woods, and brighten the whole landscape in autumn by a bold dash of glowing color. It is, however, an intelligent use of this material that betokens the skillful and successful gardener.

In the matter of general style and location of groups, it is obvious that as a rule the masses must, in all small areas, be planted along the outlying portions of the turf places, keeping the centres open. Such arrangements correspond in principle with nature's most effective groupings.

The most delightful natural landscapes show open vistas, skirted by margins of woody growth, either near or distant, which limit and support the former. A special merit of this system of planting is, that it tends to give an enlarged idea of the size of the grounds so treated. Grounds with the boundary shut off by masses of planting, and these masses arranged with irregular outlines, will look larger than they would if the boundary line were plainly in sight.

The value of a park depends mainly on the disposition and quality of its woods and planting, and on the relation of these to other natural features within its limits.

The older the wood, and the less newness and rawness there is to be seen in all the elements of a park, the better it serves its purpose. All schemes of planting are based upon orderly, seasonable adjustment, involving careful observation of the growth and development of the varied material that composes the plantations from year to year, the selection and retention of the choicest and more vigorous plants, and the removal from time to time of material planted for temporary purposes.

For this reason a permanency of employment as regards the superintendent or care-taker, if he is fully qualified to perform

the varied duties of his position, is desirable. A new broom is apt to sweep away or try to improve upon the work of the old, and may in a day almost destroy the result of careful study and years of development.

The appointment of the executive head, and the skilled gardener, should not be dictated, as is too often the case, by political motives, but by skill, qualification, and entire fitness for the responsible duties of the position.

A change of administration means usually a change in the entire policy of the preceding one. Thus plantations suffer for lack of attention and timely thinning, or open vistas are made where plantations have been massed to hide objectionable features.

The following extract, clipped from a New York paper soon after the appointment of Mr. Samuel Parsons as Superintendent of Central Park, will illustrate this principle, the new broom, in this case, being an intelligent medium of reform in the maladministration of the old one.

The same defects have been noticeable in Prospect Park, Brooklyn, from a like cause, and are being gradually remedied.

The article is entitled:

"RENEWING CENTRAL PARK.

DEFECTIVE MANAGEMENT OF THE TREES AND SHRUBBERY TO BE REMEDIED.

"The necessity of a comprehensive renewal of the plantations of Central Park is insisted upon by Superintendent of Parks Samuel Parsons, who states that a loss of shapeliness, vigor, and, in many instances, of life, has deprived them of many of their ornaments and marred the original artistic effect of the designer. This has largely resulted from stress of weather, but defective management of the original system of planting has been mainly to blame.

"The intention of the designers of these plantations was to create large masses and comparatively immediate effects, in pursuance of which trees and shrubs were set out at short distances apart, the intention being to remove from time to time such plants as showed signs of becoming crowded. The work of thinning has not been persevered in, and all over the park trees and shrubs may be seen whose shapeliness and proper development have been prevented by overcrowding, while in some parts

the plantations have suffered so from this cause that their removal and renewal is the only remedy. Where the process of thinning can still be pursued to advantage it will be necessary in doing the work to bear in mind the original intention of the designer, so as to find out the particular mass effects of sky lines, middle distance, and foreground that were aimed at, and also to comprehend the shadings of color that were intended to be produced. In order to accomplish this the missing links of color and form must be supplied in the shape of fresh trees and shrubs, and this must be done without injuring too radically the existing general effects of the park.

"The selection of trees and shrubs for the new plantations is another difficulty which presents itself in connection with the proposed renewal. During the park's existence of thirty years it has become apparent that many of those planted have proved unsuited to its soil and exposure. Among these are the Norway and other spruces, the pines, with the exception of the white, the mugho, the Cembra, Japanese evergreens, known as the retinosporas, and, among deciduous trees and shrubs, the European ash, poplar, alder, elm, and oak. On this account a careful revision of the original list of trees must be made, with the aim to use in large quantities such trees and shrubs as have come into use since the plantations were made. The work involved in the renewal will have to be done gradually, so as not to seriously mar the park's general effect, and a system will have to be established of removing only comparatively small portions of groups in different parts of the park, new mold and fertilizer being applied wherever the operation is carried on.

"For the new trees a draft will have to be made upon foreign and domestic nurseries, and the park nursery will have to be kept well supplied with young trees in the future, so that the work of transplanting can be readily accomplished at the most suitable season. An enlargement of the force employed in the park will be necessary in order to accomplish the work, and the suggestion is made that one hundred gardeners be employed in addition to the force of twenty-five or thirty now engaged, with the necessary assistant laborers, which done, the work may be greatly advanced during the coming year. An estimate of the cost of the proposed renewal is not possible, because the exact condition of thousands of trees and shrubs and the cost of handling each of them can

only be determined when the work is systematically undertaken."

The value of public gardens, places, or greens, in distinction from parks, is dependent less on the extent of their sylvan elements than on the degree of convenience with which they may be used; those being the most valuable, other things being equal, through which the greatest number of people may be induced to pass while following their ordinary occupations, and without serious hindrance or inconvenience. Therefore, if a piece of ground of one or more acres in the midst of a busy town is laid out and managed with a view to providing upon it the greatest practical degree of plant beauty in trees, shrubs, flowers, and turf, on the same general principles that a private garden for the same purpose would be, it will be of comparatively little use; for the walks will be indirect, the low planting of the outer parts will obscure the general view of passers-by, and there will be frequent crowding, jostling, and disturbance of quiet.

Neatness and the maintenance of orderly conduct among visitors in such a ground becomes also exceedingly difficult. It is much better to plant and decorate them in such a manner as will not destroy their openness or cause inconvenience to those who have occasion to cross them. For this purpose their plans should be simple and generally formal in style, their passages should be broad and direct, and they should be provided with seats in recesses (preferably) or on the borders of the broader paved or gravelled spaces, leaving ample room for free movements. The green effects of the grass, accentuated by the shadow effects of trees, properly selected and grouped, should be made the chief and most important feature of their treatment. The trees should be high stemmed and umbrageous, and flowers and delicate plants little used except in vases or as fringes of architectural objects. Union square, New York City, is a good example of this style of treatment.

Architectural adornments may properly be employed in small parks, so long as they do not seriously interfere with the open grass effect. There may be even busts or statues (if artistic in design), but especially suitable are drinking fountains, and fountain basins, with great sprays of water. The fountain basins may be effectively ornamented with lotuses, water lilies, and other decorative water plants. All such adornment of small city squares

or greens tends to appropriately enliven and enrich the general appearance of a crowded city, where the effect of everything is artificial, and more or less formal or tedious.

In the city, the surrounding conditions are not primarily favorable for the growth of plants. The air is apt to be hot, dry, and dust-laden, if not actually impure. Consequently the soil should be thoroughly enriched, and the most vigorous and hardy trees and shrubs employed. Evergreens seldom do well in large crowded cities. It is better to plant certain hardy, deciduous trees and shrubs, such as the Privet, Weigela, Snowball, *Spiræa opulifolia*, American Thorn, Philadelphus, Honey-Locust, American Linden, Norway and Sugar Maples, and the Oriental Plane trees, than to meet with failure by the introduction of other less hardy material.

The Persian rug in flowers or foliage plants is an admirable thing properly placed, but then it is not always in harmony with the natural effects suitable to a special surface of greensward. Carpet or ribbon gardening, artistically composed, is both right and proper in its way, only it should be subordinated to, as well as coördinated with, other compositions of color throughout the entire system of planting on any special lawn. Color for almost every one is a great and positive delight. This delight may be more sensuous and less purely intellectual than that inspired by agreeable form, but it belongs more truly, nevertheless, to the restful physical pleasure associated with the lawn. If gardeners were all artists, we should have fewer examples of incongruity in both form and color.

A knowledge of plants, and the possession of an adequate supply, does not always insure a satisfactory grouping and massing of them. There is needed an artistic sense of form and color effects that, if not inborn, comes only with observation, reading, and an innate love of the beautiful. A successful propagator will not necessarily be a good lawn decorator. In addition to this special fitness, there must be a general plan, carefully studied as to its application to the locality and surroundings to be treated. A ground plan should be made, drawn to a scale, of the locality to be embellished, and the beds or groupings located and carefully studied as to perspective and outline. The plants should be selected with reference to height, form, and color for each individual bed, simply considered as a part of the general

scheme for the whole plan of decorative work. In this way only can a complete and satisfactory result be secured. The flower garden treated in any other way is simply an aggregation of detached effects that have no reference to a complete design.

It would be impossible for me in this paper to specify in detail just what trees, shrubs, or plants are to be used, and what general plan of arrangement should be followed, to arrive at satisfactory results in every case. The whole matter is a question of taste, experience, and the faculty of adapting the design to the especial locality to be treated. One might as well attempt to make a general plan for a park and apply it to every park to be improved.

In the latter case the landscape architect or gardener secures primarily a detailed topographical survey showing the inequalities of the surface and all objects covering it. He makes a careful study of the surroundings, and the general topographical features to be included in the territory to be improved. The general scheme of his work will be largely dictated by the existing conditions and the environment.

The same careful study should be made by the gardener for any plan of ornamental planting, either of trees and shrubs or of purely sub-tropical and floral decoration.

To have on hand a certain number of decorative plants and to place them properly and expeditiously, with due regard to their immediate environment, requires more than the usual ability of the average gardener.

It is to be hoped that the "Theory and Practice of Landscape Gardening," now the subject of special study at the St. Louis Botanical Gardens and the Bussey Institution, will produce a class of gardeners well fitted to harmonize the general scheme of park ornamentation; to emphasize, in the larger parks of sylvan character, the natural beauties of the localities to be treated, by a judicious admixture of the ornamental features of planting; confining the floral work, if any, to the immediate vicinity of the refectories, terraces, fountains, conservatories, and other architectural embellishments, and reserving the main features of the park for woods, lawns, water effects, and natural scenery.

In the smaller city parks or places such a gardener would construct as direct and broad lines of transit as would be consistent with easy and graceful lines; he would secure ample lawns and

umbrageous trees; he would mass the shrubberies, if used, in groups of a kind for effects of color in flower and foliage; and, if flowers are used, he would harmonize these, by the introduction of sub-tropical or foliage effects, with the other features of the park, without too glaring a transition from the natural to the artificial form of embellishment. To do all this involves a careful study of the growth and habits of plants, the proper composition of soils to produce the best results, a knowledge of form and color to properly group and blend the many combinations of leaf and flower that modern introductions have made available, so as to combine effects that will be in harmony, and present a picture that will heighten, and not mar, the main features of the garden.

In Washington Park, Albany, N.Y., there are no obtrusive constructions, no bizarre effects in floral design or color, no glaring tones in the foliage, but the general impression made upon the visitor is that of a restful, pleasing landscape, well kept and tastefully arranged; and yet there is a very generous use of flowers and bedding and sub-tropical plants, supplemented by special exhibits of foliage and bench plants in July and August, and chrysanthemums in October and November. In addition to this are shrubbery borders, enlivened with selected perennials, and these are sometimes massed for especial effect of color. Mixed borders have been made in connection with a screen of flowering shrubs as a background (one of the most effective methods of using perennials), the foreground being shaded down to the bordering walk by perennials, arranged somewhat as to height.

Where detached masses of color are desired, this effect is secured by massing Larkspurs, Hollyhocks, Sunflowers, tall Phloxes, Lilies (candidum and auratum), and Pyrethrums, in solid blocks, each variety in a bed or bay by itself, thus securing color effects long after the shrubberies have ceased to bloom.

In these borders, and generally throughout the park, the plants or groups are properly named, thus affording the public an opportunity of becoming acquainted with the many varieties of plants used. The following is an extract from my report of the current year to the Board of Commissioners of Washington Park, Albany, N.Y.:

"The floral exhibits from early spring to the middle of November, both in the open borders and during the midsummer and fall exhibits in the Lake House, have afforded the public an opportunity of seeing a large range of decorative plants, with a number of recent introductions of merit. The June display of hardy roses was worthy of especial mention, covering a range of one hundred or more varieties, and embracing more than two thousand specimens. The exhibition of border plants, supplemented by special exhibits of specimen palms of many varieties, agaves, and tender stove plants, utilized in some localities especially adapted for their display, makes the exhibit in Washington Park somewhat exceptional in character, and particularly attractive to plant lovers."

"The midsummer exhibit of caladiums and other foliage plants was largely attended. This exhibit gave striking proof of the fact that the love of color and form in foliage is as attractive to many as flowers."

I add also the following from the "Country Gentleman:"

"The third annual exhibition of chrysanthemums grown in the Washington Park greenhouses was held in the Lake House, November fourth to eighth, and marked a steady advance. Just how many plants were shown it would be hard to say, additions being made from time to time as new blooms developed; but there were over two hundred varieties, against one hundred and forty last year and eighty the year before. There were three collections — the main one being "selections from stock of leading growers;" the smaller ones, "Washington Park seedlings" and "Japanese Seedlings." These two are of special interest, both as to form and color. One of the most vigorous of the Park seedlings — seed sown last January — has been trained on a fan-shaped trellis, and bore over four hundred white blooms! In richness of color, delicacy and variety of form and tint of petal, the Japanese seedlings were preëminent. They formed a complete flower garden in themselves, an effect never produced before, we think, by any single flower except the chrysanthemum."

The term "sub-tropical" is popularly given to flower gardens embellished by plants having large and handsome leaves, noble habit, or graceful outlines. It simply means the introduction of a rich and varied vegetation, chiefly distinguished by beauty of

form, to the ordinarily flat and monotonous surface of the garden. This system has taught us the value of grace and verdure amid masses of low, brilliant, and unrelieved flowers, or rather, has reminded us how far we have diverged from nature's ways of displaying the beauty of vegetation. Sub-tropical gardening has taught us that one of the greatest mistakes ever made in the flower garden was the adoption of a few varieties of plants for culture on a vast scale, to the exclusion of interest and variety, and too often of beauty and taste.

The ability to make a good selection of the most beautiful and useful from the great mass of plants known, is the gardener's pride, and in no branch must he exercise it more thoroughly than in this. Some of the plants used are indispensable — the different kinds of Ricinus, Cannas in great variety, Colocasias, Palms, many fine kinds of Dracænas, Yuccas, Agaves, Cycads, Pampas grass, Arundos, Rheums, Acanthuses, Wigandias, *Rhus glabra laciniata*, *Aralia Japonica*; — all of these, and more, are used to good advantage.

Where such plants are not available, by a judicious selection from the vast number of hardy perennial plants now grown in this country, and by associating with these flowering shrubs selected for special grace, height, and beauty of outline, a permanent garden can be secured that will, with but little care, outrival in beauty any attempt at formal bedding upon the old lines of carpet work, and never cease to be a "thing of beauty and a joy forever."

The true motive is for a restful, quiet arrangement of border planting and grouping, for harmony in color, and not for glaring, striking effects. Much of this effect is secured by the aid of foliage plants, and not with flowers.

There are two localities set apart for floral exhibits in the open borders in Washington Park, where the design of the grounds is somewhat formal, and at no other points are flowers used. The interior of the park is treated in a simple manner, the main feature of the tree growth being the size and beauty of the elms. A large number of ornamental trees and shrubs have been introduced, but they are so distributed as not to become prominent features of the landscape, the shrubs being confined to borders for screens, or massed for color effects, or treated as specimens, with ample space for individual growth and expression.

A portion of the lake in Washington Park has been set apart for the display of hardy and tender aquatic plants. The hardy varieties are planted permanently in beds depressed about two feet below the water surface. The tender varieties are removed in the fall and remain dormant, generally as bulbs, in the greenhouses, until the water is warm enough to put them in the lake the following summer, the bulbs being forced into active growth early in the spring. There is no feature in the park that has given such universal satisfaction as this aquatic plant display, and none that with ordinary care will more fully recompense the gardener.

The lake margins are treated naturally, having no stone or artificial encircling wall. The banks are well shaded, and provision is made at frequent intervals to reach the water by circuit walks and expansive beaches. The lake margins immediately surrounding the aquatic garden are planted with water-loving plants, and back of these is selected shrubbery, so that the transition from the aquatic garden to the outlying features of the park is gradual and not discordant.

The design of this paper has been, in a measure, to moderate or curb the tendency to too generous a use of flowers, arranged in geometric or formal designs, either in urban or suburban parks, and the concentration of such effects, when used, in localities especially adapted and heretofore suggested for such displays; blending such exhibits with their immediate environment, by shading down the color tones, so that, to the observer, the transition may be gradual, from the natural to the artificial, or *vice versa*, without too sudden a change in form or color; and, furthermore, I recommend the use of fewer flowers and more foliage plants. Scattered, detached effects are to be avoided. Treat the garden as one composition, each bed or group of plants being a necessary and integral part of the whole picture. Either mass for color effects in foliage or flower, or select for grouping, such shrubs as are noted for individual form and expression, giving ample room for development, and space to view them from all sides. Rely mainly upon the lawn, and natural effects of trees and shrub planting, for the impression to be made, and subordinate the artificial to the natural.

MEETING FOR LECTURE AND DISCUSSION.

SATURDAY, March 21, 1896.

A meeting for Lecture and Discussion was holden today at eleven o'clock, the President, FRANCIS H. APPLETON, in the chair.

The following paper was read by the author:

GRASSES.

By Professor F. LAMSON-SCRIBNER, B.S., Chief of Division of Agrostology, United States Department of Agriculture, Washington, D.C.

Coming to Boston to address you on the subject of grasses, is like carrying coals to Newcastle, for is not this the home of the widely known and justly celebrated author of Flint's "Grasses and Forage Plants"? But the subject is a broad one — as broad as the world is wide, and as varied as it is broad; so broad, and embracing so many diverse lines of investigation, all alike interesting, that I have found it exceedingly difficult to determine what subjects to take up, or where to draw my limitations. Good things will stand repeating, and in a multitude of counsellors there is safety. New ideas are rare indeed, but in the application of old ones may spring a happy thought of use to some one, and there always exists this possibility to encourage the speaker.

"The grass faileth; there is no green thing," is an apt expression of the extremity of desolation. Where there is no grass, there are the absolute deserts. Where our best grasses abound, and where they receive the most attention, there we find our highest civilization and greatest prosperity. Destroy the rich verdure of our pastures and meadows, and how much of the pleasure as well as the profit of the farmer's life would be blasted. Destroy the little grass plat of the contracted yard of the citizen, and how much would the enjoyment of domestic life be narrowed.

Grasses may be considered the plebeians among the families of the vegetable kingdom. They are ubiquitous, and in all temperate regions innumerable. In their number of species they constitute one-fourth of the flowering plants of the arctic zone, one-twelfth of those of the temperate region, and from one-twelfth to one twenty-fifth of those of the tropics. In the countless myriads of individuals, particularly in the temperate zone, grasses far surpass all other orders of plants. They form the rank and file of the army of plants; but here, as in armies of

men, it is the rank and file that does the real service. There are, however, lordly members among the grass family, for some of the tropical species vie with the tallest trees in height. The immense bamboo forests of India are forests of grasses, and to the dwellers of those regions they are as useful as are our own forests to us. They furnish material for the construction of their houses and household furniture and domestic utensils, articles of ornament, and sometimes even articles of clothing. Some of the bamboos furnish drink to the thirsty traveler; others occasionally supply food; and several times within historical periods have the fruits of these bamboos saved hundreds of thousands, if not millions, of people from actual starvation. So generally useful are the bamboos that their products have entered into the commerce of the world.

A mere enumeration of the diverse uses of grasses would more than occupy the time which has been allotted to me here; but at the risk of wearying you, I must briefly outline the more important of these. Grains, the product of the cereal grasses, form the staple food of more than four-fifths of the human race. Wheat is a grass, and the world's production of wheat is estimated at two billions four hundred millions of bushels. Rice is a grass, and the production of this cereal in the East exceeds one million tons, and feeds one-third of mankind. Indian corn, that king of grasses and peculiar product of America, is one of our greatest sources of income. Its cultivation now extends over ninety degrees of latitude and has been carried to all parts of the world. Oats, the most nutritious of all grain foods, barley, and rye are members of the grass family; and aside from these grains, there are a number of grasses which furnish human food, particularly to the natives of Southern Asia and the wild tribes of Africa, the value of whose product cannot be estimated. In addition to the direct usefulness of these grain-bearing grasses to man, several are used very largely to supplement the forage of our domestic animals. They have a further use also, in the production of alcoholic drinks. Nearly half of our sugar supply is derived from grasses. The world's production of cane sugar is about three million tons. What is said here of the products of the cereal-grasses indicates only in a slight degree the great usefulness to man of a very few members of the grass family. A larger number are scarcely less useful, although indirectly.

These are the grasses of our meadows and pastures, which furnish us our beef and mutton, our butter and milk; which feed our horses, the noblest of our domestic animals, and still among the most useful, in spite of electric railroads, horseless carriages, and bicycles. The money value of the hay crop of the United States for the year 1894 was estimated at nearly half a billion dollars, and the value of the grasses in pastures of the Northern States may be considered equal in value to the hay produced, while in the Southern States and the great grazing regions of the West, the value of the pasturage far exceeds that of the hay crop. A conservative estimate, therefore, of the annual value of the grasses of the meadows and pastures of this country alone exceeds a billion dollars.

"Before dismissing this subject of the utility of grasses in furnishing food for man and the animals he has domesticated, we shall do well to pause for a little reflection upon its relation to the industry, commerce, and wealth of nations, as well as to man's subsistence — our dependence not only upon the cereal grasses for our staple vegetable food, but indirectly upon the forage grasses for our supplies of animal food, namely beef, mutton, venison, and dairy produce, as well as for various animal substances such as wool and hair, hides and skins, bone and horn, oil and tallow, used for textile and other manufactures (notably woolen fabrics and leather), or for domestic purposes — the large proportion of the world's inhabitants engaged in agricultural (chiefly cereal cultivation) and pastoral pursuits, in some countries from seventy to ninety per cent of the adult male population — the vast internal and foreign trade connected with the distribution of agricultural products by land and sea — the numerous and important industries concerned in operating upon one or other form of this produce in order to prepare it for consumption; and lastly, the enormous capital employed in all these industrial activities, and the consequent accumulation of wealth. It is only when we take a comprehensive survey, such as here indicated, that we are able to form some conception of the transcendent importance of the Gramineæ." [1]

There are a number of minor uses to which many species of grasses have been applied; probably the most important is the material they furnish for paper-making. Several of our native

[1] William Hutchinson in "Handbook of Grasses," 1895.

species furnish a good fibre for this purpose, but the grass which has been used most largely in the manufacture of paper is the Esparto grass of the Mediterranean region. The quantity of this grass annually imported into England at present amounts to over two hundred thousand tons, valued at three-quarters of a million pounds sterling. Some grasses are used in the manufacture of cordage, or hats, or of matting; others make thatch; some are employed in medicine; others yield perfumery. Among the natural uses of grasses may be mentioned that of binding drifting sands and the protection of our coasts and river banks from the action of the tides or floods, and their use in protecting the soils of our fields and meadows by the covering which their turf affords. They extract from the earth and the air elements which they transform into substances that serve as food, and in doing this they help to purify the air we breathe.

Contrary to the general idea, there exists among grasses a remarkable diversity of form. So varied is this that botanists have already defined nearly four thousand distinct species. This diversity appears throughout all the organs of the grass. In some the roots are simply fibrous, and the plants grow in tufts or bunches, as Sheep's Fescue and Orchard grass; others have what we call creeping roots, and it is among these that we should look for the best turf-forming species. Some have stems less than an inch in height and appear like mosses covering the soil and rocks; others attain the height of our tallest forest trees. Some have leaves as fine as the finest thread; in others the leaves are those of the ideal blade of grass, while others again have leaves like those of palms, or leaves as short and as broad and as round as those of the well-known smilax. To explain the details and the varieties existing among the flowers of grasses would be wearisome. That grasses have flowers is an idea rarely entertained by any except botanists, and I have frequently heard the remark, "I did not know that grasses had flowers." They do, however, although their special characters may differ from those of other plants; and provision exists here, as it does throughout nearly all the tribes of vegetation which bear flowers, for securing cross-fertilization. The flowers of grasses are inconspicuous and secrete no nectar. They are not, therefore, attractive to insects, which play so important a part in the process of cross-fertilization. The pollen of grass flowers is

dry, light, and powdery, and easily blown about by the wind, and cross-fertilization among grasses is effected by this agency.

If the variety in the external form of grasses is wonderfully great, their internal structure is scarcely less so, and the histological studies of grass stems, leaves, and fruits are exceedingly interesting. Intricate problems in mechanics are exhibited in the structure of the slender cylinders which constitute the grass stem, and which, in many cases, possess a strength most surprising. The amount of mechanical tissue entering into the structure of the stem which holds a heavy head of wheat is insignificant, but the disposition of the various elements of this tissue gives it the strength necessary to perform its proper functions. Again, the leaves of grasses, which many think so much alike that they would consider the expression "as like as two blades of grass" as forcible as the more common phrase "as like as two peas," exhibit a diverse and marvelous interior structure. No more delicate tracings or beautiful designs of lace work can be imagined than are presented by these same grass leaves when viewed under the microscope. The designer might well study these tissues, for in them he would find many new figures and combinations of lines, the beauty of which he could not hope to excel, and the reproduction of which could not fail to receive the highest admiration. In their internal structure as in their outward contour, the leaves of grasses present such definite characters that these may be used to distinguish species. A minute transverse section of the leaf of Kentucky Blue grass, which one could barely see with the naked eye, would, under the microscope, present characters which at once distinguish it from all other grasses. They are totally different from those exhibited by a leaf of Orchard grass, and these again are wholly unlike those of Meadow Fescue. There are certain cells in the leaf tissue, running from the base to the summit, which are larger and have thinner walls than the surrounding cells. These special cells readily absorb or give up moisture, and because of this property they exercise the mechanical function exhibited in the expansion or opening out of the leaves, or their contraction and rolling together.

The provisions which nature has made for the distribution of grasses is an interesting subject, and one worthy of passing notice. In many cases the seeds are covered with delicate chaff-like scales, or are furnished with winged or feathery appendages,

enabling them to be widely distributed by the winds. Others are provided with hooks or barbed spines, by means of which they become attached to clothing or to the wool or hair of animals, and are thus carried about from place to place. Others are so constructed that they will float upon the water, and may be carried long distances by rivers and streams or tides. Others again have firm protective coatings, so that they may pass uninjured through the stomachs of birds or animals feeding upon them, and are disseminated in this way. These are among the natural means of distribution. The manner in which grasses have been distributed through the agency of civilization and commerce is no less varied.

The diversity of form presented by grasses is accompanied by an almost equal diversity in their station, or place of growth. Some are limited to the Arctic regions, others are found only in the tropics; some grow in the sand along seacoasts, others again are confined to the highest mountain-tops near the limits of perpetual snow; some flourish only in moist meadows, others exist in the most arid deserts; some grow in the shadows of forests, others thrive only upon open plains; some are confined to soils heavily charged with lime, others make vigorous growth where practically no lime exists. And it is with all these varied peculiarities which grasses present, that the student of these plants must become familiar, in order intelligently to direct his efforts to improve the forage and grazing resources of the country, the prime feature of interest that the farmer has in this subject.

We will now limit our remarks to the consideration of the economic grasses of this State. It is hard to say which is the most important of these. But if one pays a visit to Cape Cod, as it was my good fortune to do last summer, he will certainly be struck with the great importance of Beach grass, and the special value which it possesses for binding the drifting sands of the coast. Beach grass extends along the sandy shores of the coast just above the reach of the higher tides, from Maine to Virginia; but nowhere along our shores will one learn to appreciate more fully its usefulness as a sand binder than in the vicinity of Provincetown. The natural growth of Beach grass at this point has done much towards checking the progress of the sand dunes towards the town and harbor, the filling in of the latter being threatened by the moving of these great bodies of

sand. The Harbor and Land Commissioners of your State have undertaken to further check the drifting of these sands by transplanting Beach grass to the most exposed points, where presumably it will be most effective. The setting out of the Beach grass was undertaken in May last, and when I saw the plantations, in August, the operation was perfectly successful, and the best results may be confidently expected. This grass is the most valuable sand binder of our coast, and it should be made use of more than it is. We do not need to import the seeds of it, as has been done, nor do we need to depend upon seeds for propagation. The simplest way, and at the same time the most certain means of propagation as well as the cheapest in the end, is that of transplanting, which may be done in the spring, or in some localities doubtless in fall.[1] There is hardly any section along the seashore where Beach grass could not be used to advantage; if it does not exist near by, it may be readily and cheaply obtained. For the binding of embankments, where there is a proportion of good soil, Couch or Witch grass is available. If a good turf is desired, there is nothing better than Kentucky Blue grass, better known in New England as June grass.

There are in Massachusetts about sixty thousand acres of salt marsh, and it may be of interest to stop a moment to consider the plants that enter into the composition of the hay which these marshes afford. These salt grasses are the natural product

[1] The following letter from Mr. L. W. Ross is of interest in this connection:

BOSTON, MASS., March 30, 1896.

PROF. F. LAMSON-SCRIBNER, *Washington, D.C.:*

DEAR SIR: Agreeably to your request when I met you in Boston, I will say that I visited the Province lands at Provincetown, Mass., on March 25 and 26.

The plantings of *Ammophila arundinacea* which you saw last summer have proved a complete success. The winter has been an unusually windy and tempestuous one. Notwithstanding this, however, the plants have held the sand on the area planted securely in place and no "breaks" or "blow-outs" have appeared, to require any attention on the part of our Superintendent during the winter. This I consider somewhat remarkable, for we expected portions of it to be blown away. The whipping of the grass by the winds has broken off and blown away approximately about one-half of the bulk of grass above ground.

It has always been considered by those who claim a knowledge of Beach grass planting, that the spring season is the only one in which it should be planted. Last fall we continued the grass plantings beyond the point where we left off last spring, and contrary to claims made, at the present time it shows to be in better condition and to have stood the winds of the winter much better than the grass planted last spring.

Yours respectfully,

LEONARD W. ROSS,

Forester to Board of Harbor and Land Commissioners.

of the marshes, and the salt hay they furnish is a clear gift of nature, costing little beyond the labor and expense of harvesting. The cutting of the hay is determined more by convenience than by the selection of time when it would be most valuable for fodder, which would of course be when the principal grasses are in bloom; and the methods employed in harvesting are in many cases, and sometimes of necessity, quite primitive. The hay is cut, raked into small bundles, and carried to the stack, which is usually supported upon a circle of piles, raising it above the tides. During the winter season this hay is hauled away for use as fodder or litter or mulch, or shipped to the larger towns for packing purposes. On the higher and dryer marshes other methods of harvesting may prevail. The characteristic grasses of the marshes are the Spartinas. There are several species of these, and several of them have a very wide distribution along our coasts, and occur also upon the coasts of Europe. One of the largest of these Spartinas, growing where there is a daily flow of tide, chiefly along the ditches and creeks, is the common thatch or creek sedge. It is conspicuous by its size and its broad, spreading, shining leaves. It imparts a disagreeable flavor to the butter and milk from cows fed upon it, and is rarely used for fodder, but chiefly for thatch or litter. The finer variety of the same species is more widely scattered over the marshes proper, growing to the height of from one to two feet. This has narrower, more erect leaves, and is of a lighter green color. Like the large form, it imparts a disagreeable flavor to the milk from cows eating it. Red-salt or Fox grass is another Spartina; a smaller species with wiry stems and slender leaves, and is one of the best known of the grasses of the salt marsh, and one of the most valuable. It makes fairly good hay where better cannot be had, and is a particularly useful species for packing crockery and glassware. The diœcious Spike grass, less known than the others, but fairly common on the meadows, also furnishes good packing material. I saw this covering considerable areas on the low marshes at Cape Cod, the male plants and the female plants occupying separate areas, and conspicuous by the yellowish hue which they gave to the vegetation. It is interesting to note that the various grasses of the salt marshes do not ordinarily grow intermingled, as do the species which compose our meadows and pastures, but each holds exclusively areas of greater or less extent.

The largest and most striking of our native grasses, *Phragmites communis*, is occasionally found upon our salt marshes, although it is not limited to these localities. It is a species widely dispersed throughout the temperate regions of the world, growing along the margins of rivers and freshwater lakes. It has remarkably long and deeply penetrating roots, and is especially valuable as a sand and soil binder. There is a small area of this grass growing in the sands near the water's edge on Cape Cod, where it is exposed to the extreme action of the winds and storm tides. It has existed there for many years, and its power to withstand the elements and fix the sands is clearly demonstrated. While its foliage may not resist the cutting action of the blowing sands, as do the leaves of Beach grass, its power to resist the action of the waves is greater. Wherever the waves of the higher tides reach the sands occupied by Beach grass, it is soon destroyed.

Upon the higher portions of the marsh, which usually escape the ordinary tides, occur several fine grasses of excellent quality. Among these are the Creeping or Red Fescue, Sea Spear grass, Creeping Bent or Brown-top, and Black grass. The Creeping Bent or Brown-top is one of the best and most tender grasses for fodder which the marshes produce. It is only a variety of the well-known Redtop of our meadows, with stems which are more or less creeping at the base, and with a less spreading panicle. Sea Spear grass (*Glyceria maritima*) is not uncommon on the marshes of the New England coast, extending southward to New Jersey. It is a tender grass, liked by cattle, and when abundant makes a valuable addition to the salt hay designed for fodder. Red Fescue (*Festuca rubra*) is a native, and occasionally appears upon the marshes, although more abundant upon the sandy soil of waste lands bordering them. It is a grass of excellent quality, and often enhances considerably the value of marsh hay. Of all the grasses of the marshes proper, there is none more highly prized for hay than Black grass (*Juncus Gerardi*), which extends all along the Atlantic coast, from the Gulf of St. Lawrence south to Florida. This, as you will notice, is not a true grass, but a rush, its botanical characters being quite distinct from those of the Gramineæ. Its slender erect stems are from one to two feet high, somewhat wiry, yet soft and apparently palatable to stock. It contains less fibre and a higher nutritive ratio, as is shown by chemical analyses, than Timothy and Redtop.

A more familiar topic, and one of greater interest to the most of us, is the grasses of our meadows and pastures. They are the grasses which feed our cattle; they are the grasses which brighten and beautify the landscape. They are numerous in species, and a mighty host in individual numbers. I would it were possible for me to introduce to you the various members of the grass family which have made a home upon our soils. Each one has a history; each one has its peculiar characteristics, distinguishing it from its neighbors. Each one has its field of usefulness, and many of them stand ready to become far more useful, if we will but extend to them the helping hand which we have held out to the few cultivated grasses, to shield them from the attacks of enemies and rivals, and aid them in their struggle for existence. They are all beautiful in their gracefulness, and nothing adds more charm to the landscape than a field of waving grasses or a pasture of emerald turf. Did you ever stop to think of one of the prime features of these grasses which makes them so useful to man? It is this: their power to exist under repeated cuttings or under the continued grazing and tramping of stock. What other plants possess this quality, even to a slight degree? To graze or mow the turf-forming species, and walk or tramp upon them, instead of destroying them, apparently adds to their vitality, and surely improves their quality. This certainly seems like a provision in nature, directed by an all-wise Providence, for the good of mankind.

I must confine myself to a few species, those of greatest recognized importance for hay, for pasture, or for the lawn. The best wild or native hay grasses are Blue Joint, Fowl Meadow grass, a species of Glyceria, and one of the Muhlenbergias or "drop-seeds." These are valuable in the order named, and often afford in our low-lying meadows a large bulk of native hay of excellent quality. Like other species of grasses, they respond readily to good treatment, and the specimens I have here to show you, clearly exhibit their capabilities. Timothy, Meadow Fescue, Orchard grass, Rye grass, and Redtop are the chief and best known of the cultivated or so-called "tame" grasses for the production of hay. In the markets, Timothy is the recognized standard by which the value of other grasses is estimated. It is the farmer's gold coin, although it does not appear to me to be equal in some respects to other varieties. Its clean appearance, even

growth, fair productiveness, and easy propagation make it a favorite grass. The presence of Meadow Fescue indicates a good soil, and upon well-drained clayey lands it is one of the best grasses we can cultivate; it is alike good for hay and pasturage. Where the soil is more moist, but deep and strong, the Large Fescue (*Festuca arundinacea*) may be cultivated. It is one of the most productive of the hay grasses. Almost equally productive on soils suitable to it is Orchard grass, and by many of our farmers this is regarded as equal, if not superior, to Timothy. It has a serious fault, however, of growing in bunches or tussocks. It is not a turf former, and when cultivated the seed should be sown thickly, and it is a good plan to add some other species as a filler. This objectionable habit of Orchard grass may be overcome in a measure by heavily rolling the fields in early spring. Were it not for this tussock-forming habit, Orchard grass would make one of the best of grasses for pastures, because of the early and abundant production of tender leaves. Rye grass, so popular in England, has never come into much favor here, although it is usually recommended as an ingredient for mixtures designed for permanent pasture. On very rich soils, where the ground is fairly moist and the atmosphere humid, its productiveness is very large. It will make a fair turf if well cared for, and may be used alone for lawns, but not in mixtures. Redtop is one of the finest and best of our hay grasses, especially for low meadows, but is less productive than other sorts. The requirements of a good hay grass are productiveness, hardiness, and adaptability to the soil. It must also be nutritious, rich in flesh-forming elements, and possessing little fiber, and must be palatable to stock. I will not attempt to discuss here the question of mixtures for permanent or temporary meadows, further than to say that they must be based upon the conditions of the soil and climate and the wants of the farmer. Regard must also be paid to the time of or succession of blooming of the several varieties which may be sown.

Our pasture grasses are more numerous than those which yield us hay, and a just consideration of them would more than occupy the time of a single lecture. The most important kinds are Meadow Foxtail, Kentucky Blue grass, English Blue grass (*Poa compressa*), certain varieties of Redtop, and species of Fescue. Meadow Foxtail is one of the earliest, quite productive, and by

many is very highly esteemed. It is recommended in all mixtures compounded for the production of continuous herbage through the season. Kentucky Blue grass is a good turf former and a good pasture grass where the land is rich, but does best upon strongly calcareous soils. It is the grass which has made the pastures of portions of Kentucky and Tennessee so justly famous. English Blue grass is, I think, a better pasture grass for New England than Kentucky Blue grass. It will grow on a greater variety of soils. It will grow on soils so thin and poor that little else will grow. On good land its productiveness is scarcely inferior to that of Kentucky Blue grass, and it is equally tender and nutritious. It makes a very firm sod, and withstands the tramping of stock better than many other kinds. The cultivation of this grass in certain portions of Virginia has changed poverty-stricken districts to areas of wealth and prosperity. This has been effected by the cultivation of this English Blue grass and the raising of dairy stock. From my knowledge of New England pastures, I can think of no grass that I would more highly recommend. Lowland pastures should always contain Redtop in some of its varieties. It makes the cleanest, nicest-looking, and sweetest turf of any grass I know. The fine-leafed varieties should be selected for cultivation in pastures. Of the Fescues, Meadow Fescue is a valuable pasture grass, as already intimated, where the soil is good; and on sandy soils Red Fescue is an excellent variety. On the dry uplands Sheep's Fescue is perhaps one of the best species we can cultivate, associating with it English Blue grass.

There is nothing more pleasing to the eye or more beautiful than a well-kept lawn. There is nothing that speaks more strongly for the owner of a house than the lawn which fronts it. The lawn upon the outside should be like the carpets within, and be kept clean with equal care. It is capable of giving pleasure to vastly more people than can enter the door and see the beautiful Wiltons and moquettes, for every passer-by may enjoy it. A good lawn is one of the simplest things to produce, yet one of the most difficult; at least one may reasonably judge it to be difficult by the vast array of wretched failures that appear in almost every neighborhood. What the lawn needs is good turf, and the climate here is excellently adapted to the production of just such turf as is most desired. There are a great variety of

grasses which will produce turf of pleasing appearance under careful management, but this turf varies in fineness and quality, according to the species used to make it. We do not need any lawn mixtures to make a lawn. The worst initiative in the making of a lawn is the sowing of a mixed lot of seeds. The best turf I have ever seen was composed of single varieties in pure cultures, and their beauty fully warrants the extra care and expense necessary for their production. I am happy to be able to show you pictures taken in the most famous grass garden — or turf garden as the manager calls it — in this country. You have all heard of it, and some of you have doubtless met the genius who has developed it. This garden is tended with scrupulous care and given daily attention. Not a weed, not a blade of grass foreign to the variety cultivated, is allowed to appear in any of the plots, or if appearing it is at once removed. It is at all times beautiful, but under the slanting rays of an afternoon sun, the beauties of this garden are most clearly brought out. At a short distance it looks more like unrolled webs of carpet or bands of delicately and variously tinted ribbon, than anything else one can suggest; and here we are able to see the turf-forming qualities (under the treatment given them) of many grasses and of many varieties of a single botanical species. To study the texture of these is most interesting, and the illustrations which I have to show you will in a very faint degree bring out the differences of texture they exhibit. The finest and best varieties of turf, and consequently for lawns, are those of Festuca and Agrostis. Some of the forms of Agrostis are exceedingly fine, yielding what we may very properly term a "nap," almost as fine and soft as that of velvet. Some varieties of Festuca are no less beautiful and hardly less fine. How these grasses would thrive under the shade of trees I cannot certainly say, but I recall a remark made by Mr. Olcott when asked which would do best in the shade. It was: "Those that do best in the sun." While some may question the exact truthfulness of this remark, there may be more in it than we may at first suppose. But there are good turf grasses which will grow in the shade of trees, where the shade is not too dense and they are given a reasonable amount of care. These are Meadow Foxtail and the Various-leafed Fescue (*Festuca heterophylla*). Crested Dogstail is spoken highly of by some; also Rough-stalked Meadow grass

(*Poa trivialis*) and Wood Meadow grass (*Poa nemoralis*). If I were experimenting, I should use by preference the Various-leafed Fescue or Wood Meadow grass. Where the lawn is small, it looks best unbroken, but in those of considerable extent, trees and shrubbery may be added to adorn it, and with these ornamental grasses may be planted. There have been introduced into cultivation many grasses of special beauty and attractiveness which may be used with good effect singly or in groups upon the lawn. One of the finest of these and the most showy when in bloom, is the beautiful Pampas grass. Nothing surpasses the elegance of its light and silvery-tinted plumes. Where they will grow, some of the bamboos are used with good effect to decorate the lawns; and the large Arundo with its beautiful white-striped leaves, and the more common Eulalia, and forms of our own Phalaris, belong to the group of ornamentals. Then there are finer and more delicate species sometimes used for borders, and of these we may mention such as species of Love grass and the elegant little Brizas.

As in all families of any size or pretension we always find among the good members composing it a few black sheep, so it is with the grasses. As good as they are, as useful as they are, as beautiful as they are, there are some which by their conduct, by their selfishness, by their intrusiveness, have become obnoxious, and we call them weeds. The worst of these which the New England farmer has to contend with is Couch grass. There are others, but we will not mention names in so goodly a company. It sometimes happens that men who are very correct in all they do under the restraint of home influences and are counted among the elect, when removed from these influences, will stray from the path of rectitude. So it is with grasses. Our much-loved Kentucky Blue grass, which every one esteems as a good and useful grass citizen, has received a bad name away from home. In New Zealand and Australia its habits are such that it has come to be looked upon as a vile weed — a lawless outcast, despised by everybody.

Your President suggested that I tell you something of what we are doing in the Division of Agrostology. Well, the Division is devoted to the investigation of grasses, and, in addition, to the investigation of forage plants other than grasses. From what I have said already, it is evident that the work is broad, and

involves many special lines of study. The work is intensely interesting, and it is our purpose to make it useful to you all. Our main force at this time is directed to the preparation of a work in which shall be illustrated and described all the North American species of grasses, of which there are more than seven hundred. I am able to show you the character of the illustrations. They are all original, carefully drawn, and executed on wood. The descriptions will be drawn from the specimens, and it is no simple matter to classify these specimens into their proper species, as the botanists among you will understand. During the summer season we have agents in the field collecting the grasses of the country, grass seeds of the more promising native species, and live roots of grasses. These seeds and roots are being propagated in the gardens established by the Department; and at the same time the material thus gathered is distributed to other investigators with a view of widening our knowledge by cultural experiments at other points, or is used in making exchanges. We have a large correspondence that has to be attended to, and questions are asked us relative to the qualities of various grasses and the kinds to be sown in given localities. We try to answer all these questions, but occasionally one is asked which exceeds our ability to answer; for example, this, which was actually asked us: "What was the first principal grass that began to grow on what we know as the prairies of Illinois after the drift period or ice age, and the date, if known?" Such questions we are forced to refer to a higher authority. Then there are collections of grasses constantly being received from various sources, to be named; this work takes time, for often the collections come from regions where the species are little known and their identification involves much study. The care of our grass gardens consumes considerable time, and also the handling of the seeds and the duplicate collections. Our main work, to which our energies at present are chiefly directed, is, as just stated, the preparation of what may be termed the "Handbook of North American Grasses."

The subject selected for me was "Grasses." It is surely an interesting one, and I shall indeed have failed in my purpose if I have not succeeded in securing your interest in it. I have found it impossible to do more than to indicate the importance of grasses, or hardly more than to name a few of their uses or

suggest a few topics for research, almost any one of which would afford an hour's entertainment or profitable discussion. The investigation of grasses has engaged the attention of the ablest men of science, and the study of their development, their classification, their inter-relationships, and their relation to other plants and to man opens a field to philosophy. They constitute the wealth of nations; they feed the world; they minister to the higher esthetic tastes of mankind by their graceful and varied beauty; they heal the sick, and make glad the well.

Discussion.

The lecture was illustrated by means of the stereopticon; views were given of the gardens of the Division of Agrostology in Washington, where the experiments in propagation and cultivation of grasses are carried on; also views of the numerous species of grasses of which the lecturer spoke, some of which showed the type of the illustrations to be expected in "The Handbook of North American Grasses," now in preparation. Bundles of numerous species of grasses were laid out on the tables for examination, each bundle being carefully prepared and labeled with both botanical and common names.

Mrs. —— Wright said that reference had been made to the Buffalo grass of the plains, and asked whether this grass can be removed to other localities, and if so, whether its nutritious qualities will be the same.

Professor Scribner replied that Buffalo grass was cultivated successfully in the grass garden at Washington, but he could not say whether it became less nutritious.

In reply to another question Professor Scribner said that the best English lawns are composed of single varieties of grasses. When asked if Alfalfa was included among the grasses, he said that Alfalfa does not belong to the family of true grasses, but to the clover family; it is one of the most important forage plants of the country.

On being asked whether a lawn could be made of white clover Professor Scribner answered that such a lawn would be unique; he would prefer grasses, but white clover is often used with grass, and in this way will make a very pretty lawn. The color of its leaves is the same as that of some species of grasses. There is an astonishing variety of color in grass leaves; different tints

occur even in the same species. By planting grasses of various colors a mosaic might be made, if desired.

An unknown gentleman asked whether the line can be drawn between grass and other plants used for human food. The answer was that botanically the line can be drawn. Grass is popularly used in a very wide sense, often including clover.

Another questioner asked the origin of Couch grass. Professor Scribner replied that it is a native of this country and is also known in Europe. It is commonly thought of as a weed, but it gives good crops for a year or two, when it chokes itself out. It may be improved by harrowing the sod formed, as is done in the West.

Professor Scribner stated that "The Handbook of North American Grasses" will be published in the fall of this year.

Benjamin P. Ware asked what is the best grass for sod. The reply was that *Agrostis alba* var. *stolonifera* or Creeping Bent has been shown by Mr. Olcott to be the best for lawns. Mr. Ware then questioned about June grass or Kentucky Blue grass as compared with it. Professor Scribner replied that the Fescues make a firm, close sod. Kentucky Blue grass is very fine, but not as fine as the Creeping Bent or Rhode Island Bent.

Being asked if Sweet-scented Vernal grass is good in the lawn, Professor Scribner answered that it is a weed in any lawn.

MEETING FOR LECTURE AND DISCUSSION.

SATURDAY, March 28, 1896.

A meeting for Lecture and Discussion was holden today at eleven o'clock, the President, FRANCIS H. APPLETON, in the chair.

The following paper was read by the author:

MANURING ORCHARDS.

By Professor EDWARD B. VOORHEES, Director of the New Jersey State Agricultural Experiment Station, New Brunswick, N.J.

My main purpose in this discussion of the question of manures for orchards is to show the necessity of studies and investigations concerning the food requirements of the various fruits, rather than to point out methods of practice that shall be

economical and systematic. We have suggestions from numerous sources in regard to the particular needs of particular kinds of fruit for plant food, but we have in the reports of our experiment stations and agricultural societies very few results bearing upon this subject which have been derived from actual experiment. It is quite natural, perhaps, that this should be the case, because fruit growing as a business, or on a commercial scale, is comparatively new, and because the character of the investigations necessary to be carried out in order to obtain reliable data must be continued. The development of fruit growing as a specific crop has, too, been gradual, and has found its first considerable increase in sections of the country within easy reach of good markets, and upon soils particularly adapted for the purpose, which, perhaps, furnishes another reason for a lack of scientific investigation along this line.

Fruit Crops and Grain Crops differ in Respect to their Needs for Plant Food. — It is obvious, too, that such specific results as have been obtained concerning the needs of general farm crops, as grain and grass, for specific plant food elements cannot be applied with any degree of accuracy to fruit crops, particularly the larger fruits, as pears, apples, peaches, grapes, and plums, because these differ from the cereals, grasses, and vegetables, first, in their habits of growth, second, in the character of the produce, and third, in their relation to soil exhaustion.

In the first place, farm crops, as a rule, require but one year for the entire processes of vegetation and maturation. For fruit crops, with but few exceptions, the purely vegetative processes continue for at least three years, and with many kinds much longer, while after the fruit-bearing period begins the vegetative processes do not cease, but are coincident with the growth and ripening of the fruit. In the second place, the product of the harvest, namely, the fruit, differs very materially in its character from that of ordinary farm crops which mature their fruit and die in one season, because a whole season is required for its growth and development; that is, it is necessary that there shall be a constant transfer of the nutritive juices from the tree to the fruit throughout the entire growing season, while the growth for each succeeding year of both tree and fruit is dependent upon the nutrition acquired and stored up in buds and branches, as

well as upon that which may be derived directly from the soil. In the third place, the relation of fruit growing to soil exhaustion is very different from that in general crop farming, because in orchards there is an annual demand for specific kinds and proportions of soil constituents; it is really a continuous cropping of the same kind; there is no opportunity, as in the case of ordinary farm crops, to correct the tendency to exhaustion by a frequent change of crops, or the frequent growth of those which require different kinds and amounts of plant food constituents.

Nitrogen, Phosphoric Acid, and Potash are the Elements needed in Manures for Orchards. — In studying methods of manuring orchards, however, it must be admitted that the general principles of manuring which apply to fruits, apply quite as well to farm crops; that is, the essential constituents of manures must be the same. A fruit tree will not make normal growth in a soil destitute of nitrogen. That nitrogen encourages leaf growth is a recognized fact, and, since trees grow by means of both leaf and root, its presence is required in the soil in order to promote the growth and extend the life of the tree. It is very evident, too, that potash is an essential constituent in the growth of fruits, not only because it constitutes a large proportion of the ash of the wood of the apple, pear, cherry, and plum, and more than fifty per cent of the ash of fruit, but because it forms the base of the well-known fruit acids; and in order to nourish a tree properly, as well as to insure proper ripening, phosphoric acid is also very essential, though it is apparent from such investigations as have been made that this constituent is relatively of less importance than for the cereals.

It is also a matter of common observation that, in the production of stone fruits particularly, lime is an important constituent. Its function seems to be to strengthen the stems and woody portion of the tree, to shorten the period of growth, and to hasten the time of ripening. Fruit trees growing on soils rich in lime show a stocky, steady, vigorous growth, and the fruit ripens well, while those on soils which contain but little lime, particularly the clays, appear to have an extended period of growth, the result of which is, that the wood does not mature and the fruit does not ripen properly.

The Need of Manures for Orchards. — It is argued by

many, and sometimes by those who should know better, that fruit growing is quite similar to growing trees; that the question of soil exhaustion is not a matter of very great importance, provided the soil is well cultivated, and that all soils contain sufficient quantities of the food elements to insure the relatively small available supply required from year to year.

It is admitted that on soils of good mechanical condition, well drained and cultivated, which are naturally adapted for fruit as well as other crops, because well supplied with the essential constituents, nitrogen, phosphoric acid, potash, and lime, the exhaustion arising from the continuous removal of crops will not become apparent for a long time, but it should be emphasized that it is only upon soils which possess these characteristics that the growth of fruit, even poor fruit, can be continued for any considerable period without the application of manures.

While we have abundant evidence of the need of manures for orchards, derived from our knowledge of the fact that even virgin soils possess, as a rule, a low rather than a high natural strength, and are, therefore, incapable of furnishing for a long time a sufficient amount of one or more constituents, I desire to present further evidence, derived, first, from experiments conducted to determine the relative needs of plant food by certain fruit crops, and second, from such results of actual practice as I have been able to collate.

The only completed experiment in this line is reported by the New Jersey Experiment Station on peaches.[1] This experiment was begun in 1884, and the results fully reported in 1894, though I shall only use the results secured up to 1894.

The object of this field experiment was to study the comparative effect of an annual supply of what was deemed a sufficient quantity of the best forms of the three plant food elements, nitrogen, phosphoric acid, and potash, when used singly and in various combinations; and of large applications of barnyard manure. The experiment included thirteen plots, each one-tenth of an acre in area, and containing thirteen trees. Each of the fertilized plots received an annual application of 150 pounds of nitrate of soda, 350 pounds of bone-black superphosphate, or 150 pounds of muriate of potash per acre, thus furnishing an equivalent of 24

[1] Annual Reports New Jersey Experiment Station, 1884-1894.

pounds of actual nitrogen, or 56 pounds of "available" phosphoric acid, or 75 pounds of actual potash on the three plots which received single elements, and combinations of these amounts of two of the elements on three other plots, and a combination of all, or a complete fertilizer, on one plot. In addition, two plots were not manured; one received land plaster at the rate of 100 pounds per acre; one barnyard manure, at the rate of 20 tons per acre, and one barnyard manure, at the rate of 10 tons, and lime at the rate of 50 bushels per acre.

Accurate records were kept each year of the health and vigor of the trees, and of the yield of the various plots. The soil — a clay loam with clay subsoil — was of medium natural fertility, responding readily to manures; its mechanical condition good, and fairly representative of the soil in the peach-growing sections in New Jersey.

At this point I will give detailed results and comparisons only in case of the plots without manure, with a complete manure, and with barnyard manure.

The average age of an orchard in our State is about eight years, during which period three full crops are usually secured. I therefore give the average yield in baskets for the average period of the life of the orchard for the whole period of the experiment and for the crop years.

I. — The Yield without Manure.

	Baskets per acre.
1884–1891, inclusive, 8 years, average per year	65.7
1884–1893 " 10 " " "	60.3
1887–1891 " (5 crop years) " "	105.0
1887–1893 " (7 crop years) " "	86.2

II. — The Yield with Complete Chemical Manure.

	Baskets per acre.
1884–1891, inclusive, 8 years, average per year	164.2
1884–1893 " 10 " " "	183.4
1887–1891 " (5 crop years) " "	262.8
1887–1893 " (7 crop years) " "	262.0

III. — The Yield with Barnyard Manure.

	Baskets per acre.
1884–1891, inclusive, 8 years, average per year	169.5
1884–1893 " 10 " " "	194.7
1887–1891 " (5 crop years) " "	271.3
1887–1893 " (7 crop years) " "	276.8

IV. — The Relative Yield in an Unfavorable Season.

	Baskets per acre.
1889 unmanured	10.9
1889 fertilized	152.5
1889 manured	162.5

The first point of importance and value observed is in reference to the number of crops that were secured. On the unmanured land, the crops secured after eight years were so small as to materially reduce the average for the whole period, while for the manured land the average for the whole period was not only not reduced, but very materially increased; that is, the crops secured on these after the trees on the unmanured land had practically ceased to bear were greater proportionately than those secured previous to that time. This was true both for the fertilized and manured land.

In the next place it is shown that the yield was very materially increased by the use of manures, either in the form of artificial or natural supplies, and the differences in yield derived from these two forms are very slight, indicating that very much smaller amounts of actual plant food in quick acting forms were quite as useful as larger amounts of the less available forms in which the food exists in natural manure products.

For the ten years, the fertilized plot received 250 pounds of nitrogen, 560 pounds of phosphoric acid, and 750 pounds of potash, while the yard manure plot received — assuming the average composition of yard manure — 2,000 pounds of nitrogen, 2,000 pounds of phosphoric acid, and 1,600 pounds of potash; yet with eight times as much nitrogen, nearly four times as much phosphoric acid, and more than twice as much potash, the yield was but 113 baskets greater, or 11 baskets per year. There was no material difference in the size of the trees on the two plots;

in both cases they were large and for the most part healthy, even when the experiment was concluded, which was not caused by the normal dying of the trees, but by the fact that the larger number of them were partially or wholly destroyed by a severe windstorm.

In the third place it is interesting to observe — and it is a point of great importance — the effect of an abundance of food in overcoming unfavorable weather or seasonal conditions. The year 1889 was extremely unfavorable, and the crop throughout the State was small. In this experiment the unmanured plot yielded at the rate of 10.9 baskets per acre, while the manured and fertilized plots both showed a yield exceeding 150 baskets per acre. The manure strengthened and stimulated the trees and enabled them successfully to resist such conditions as were fatal to the crop on the unmanured land.

This point is one that is seldom considered in calculating the advantages to be derived from proper manuring, though it is of extreme value, since the expenses of cultivation, trimming, and interest on investment are quite as great in one case as in the other.

Another experiment bearing upon this point, recently reported by the Cornell Experiment Station,[1] is also very instructive as indicating the need of manures for fruit trees, not only in reference to the amount removed, but also in reference to the proportions of the essential constituents required.

This study shows that the plant food contained in 20 crops of apples, of 15 bushels per tree and 35 trees per acre, and in the leaves for the same period, amounts in round numbers to 1,337 pounds of nitrogen, 310 pounds of phosphoric acid, and 1,895 pounds of potash. These amounts of plant food are compared with the amounts that would be removed by 20 years continuous cropping with wheat, assuming an average yield of 15 bushels of wheat per acre, and 7 pounds of straw to 3 bushels of grain, viz.: 660 pounds of nitrogen, 211 pounds of phosphoric acid, and 324 pounds of potash. By this comparison it is shown that the 20 crops of apples remove more than twice as much nitrogen, half as much again of phosphoric acid, and nearly three times as much potash as the 20 crops of wheat.

---

[1] Bulletin No. 103, "Soil Depletion in respect to the Care of Fruit Trees."

These results, although only applying strictly to the apple, are valuable in indicating the rate of soil exhaustion by fruit growing. It is to be remembered, however, that the larger root development of the tree would enable it to draw its nourishment from a larger area of soil than is the case with wheat, and thus probably permit of normal growth for a longer period.

The Experience of Practical Orchardists. — The experience of practical fruit growers, particularly if they are successful, is also of value in this connection.

During the past year statistics were gathered in New Jersey concerning the methods of practice in fruit growing, and among the questions asked was, "The kind of manure used and the amounts applied per acre." The results obtained are instructive in showing, first, that orchardists do recognize the necessity of a liberal feeding of their fruit crops; and, second, that the rate of profit, other things being equal, is largely dependent upon such a practice, though the methods in use are widely different, and, in many cases, unsystematic and irrational.

I have selected those gathered in Burlington County, on pears and apples as illustrations, because they furnish good examples of progressive practice, and because those from other counties have not been finally tabulated. Of 169 growers of pears, representing an area of over a thousand acres, 162 use manures of some kind; 54 only barnyard manure, the application ranging from 5 to 15 tons per acre annually; 41 use commercial manures, exclusively, the larger part of which consists of ground bone and muriate of potash, the annual application averaging 600 pounds per acre; 33 use barnyard manure and fertilizers together, an average application of 11 tons of the former and 600 pounds of the latter per acre; 34 use miscellaneous home products, including lime, wood ashes, coal ashes, river mud, muck, etc.; and 7 only of the entire number do not manure at all. Of this whole number, 90 per cent report that fruit is the most profitable crop that they raise, the gross returns ranging from $50 to $600 per acre, with an average of $150.

Of 194 growers of apples, 183 use manure; 82 barnyard manure exclusively, at the rate of nine tons per acre; 30 both barnyard manure and fertilizer, at the rate of nine and one-half tons of the former and 500 pounds of the latter; 29 use fertilizer alone, chiefly bone and potash, at the rate of 700 pounds per acre; 8 use

barnyard manure and lime; and 34 use miscellaneous products. Their average gross returns are about $100 per acre, and practically every grower reports that the crop is a profitable one. We have here a practical unanimity of opinion as to the necessity of using manures, though a wide difference in practice in reference to the kind of material used, which is in many cases due to the relative cost of the various materials, rather than to definite opinions concerning their relative value.

The Kind of Manure to use. — The kind of manure to use may be discussed, first, as to whether it shall be natural or artificial, and, second, if artificial, the kind of materials and the proportions of the constituents most desirable. In reference to the relative usefulness of yard manure and the best forms of chemical fertilizer the data derived from the experiment on peach trees are instructive, and I simply add to that already given a financial statement showing the relative values of the crops secured, less actual cost of manures, and which does not include the cost of application.

V. — New Value of Crops from Fertilizer and from Natural Manures.

	Per year.
Unmanured, 10 years, value of crop, $301.85	$30 18
Fertilized, 10 years, value of crop, less cost of fertilizer, $810.20	81 02
Manured, 10 years, value of crop, less cost of manure, $673.70	67 37
Annual net increase from fertilizer	51 02
Annual net increase from manure	37 19

As has been already suggested, the amount of yard manure applied may have been much larger than was necessary, though it is very clearly shown that the use of chemical fertilizer, under the conditions obtaining in the experiment, was relatively more profitable than the manure; hence, while it is hardly safe to conclude that chemical fertilizers may in all cases be more profitable than the manure, it was shown in previous tabulations that chemical fertilizers did practically meet the demands for plant food; that is, the yield was but little greater from the use of barnyard manure.

In reference both to the kind of materials and to the proportions

of the constituents most desirable, we have to depend rather upon the opinion of experts than upon well ascertained data, though the Cornell experiment, already quoted, is interesting in that it throws considerable light upon the question of proportion of the various constituents. In this connection I shall quote the opinions of leading horticulturists.

In "Farmers' Bulletin," No. 33, of the Department of Agriculture, on Peach Growing, Erwin F. Smith, the author, under the caption "Fertilizers," says: "Some words are necessary on the use and misuse of fertilizers. Unless the trees are on strong land it will be necessary as soon as they come in bearing, and yearly thereafter, to give them each spring or autumn some special fertilizer. There can be no objection to the use of well composted barnyard manure. Where this is not procurable dependence must be put on clover and commercial fertilizers, taking care always that the latter are obtained from reliable sources. In general the dependence should be on potash salts and phosphates rather than on nitrogenous fertilizers. The peach can be injured readily by excess of nitrogen. Its effect upon the trees is to produce excessive growth of wood and foliage at the expense of the fruit. Fifty to a hundred pounds per acre of nitrate of soda or its equivalent in dried blood or sulphate of ammonia is usually as much nitrogenous fertilizer as any orchard requires, and many orchards do not need it at all. Muriate of potash, kainit, or sulphate of potash may be used in large quantities without injury. Four to five hundred pounds per acre will do no harm, provided it is not put too close to the trunks of the trees."

This opinion is based upon the results of studies to determine the relation of fertility to peach yellows, which were not continued for a long period.

In Bulletin No. 72 of the Cornell Experiment Station, Professor L. H. Bailey says:

"Nitrogen, potassium, and phosphorus are the elements which need to be applied to orchard lands.

"Nitrogen is particularly efficacious in promoting growth. In fact the amount of growth and the color of foliage are reliable guides for the application of nitrogen. Orchards are grown for fruit, not for forestry purposes. In general, it is better to supply nitrogen by good cultivation — which assists nitrification — and

an occasional green manure crop, than by the application of nitrogenous fertilizers. If the orchard is not growing and is yellowish in foliage, good cultivation — begun early and repeated very frequently — in connection with the use of potash, phosphoric acid, and green manures, will commonly correct it.

"Potash is generally the most important element to be applied directly to orchards, particularly after the trees have reached bearing age. The store of available potash in the soil is much increased by the thorough tillage which has already been recommended, but in bearing orchards it should also be supplied every year in some commercial form.

"In general, phosphoric acid is rather less important in fruit plantations than potash, although this order is reversed in general farming. Potash should undoubtedly be the leading factor in orchard fertilizers, and nitrogen, as I have said, may be obtained mostly by means of tillage and green crops."

Again, in Bulletin No. 74, Professor Bailey says:

"I believe that the keynote to the proper fertilizing of peach orchards is potash and phosphoric acid, and not nitrogen. Ashes, muriate of potash, bone fertilizers — these are some of the money makers for peach trees. Tillage, with green manure crops at the end of the season, can be relied upon to furnish nitrogen in most instances. I do not wish to disparage the use of nitrogen, for even in bearing orchards a direct application may sometimes be necessary; but I desire to state what I believe to be a fundamental consideration in orchard culture, that nitrogen can easily be used to excess and that it can generally be obtained by means of tillage and green manure, and also that potash and phosphoric acid need to be annually applied to orchards of bearing age."

The points contained in the above statement are again emphasized by Professor Bailey in Bulletin No. 102. These opinions of Professor Bailey are based largely upon theoretical considerations, verified by his wide observation.

Professor L. R. Taft, in Bulletin No. 103 of the Michigan Experiment Station, says:

"Of the three elements that are often deficient in the soil, potash, phosphorus, and nitrogen, it can be said that a rich virgin soil will generally contain all that is needed for an orchard, but after the trees have matured several crops of fruit, the available potash and phosphorus is likely to become so reduced that a satis-

factory growth cannot be obtained, and if the soil is in any way deficient in organic matter, the amount of nitrogen will probably be rather small. As a rule, a bearing orchard should have, once in two years, from 300 to 500 pounds of ground bone, 200 to 300 pounds of muriate of potash, and 150 pounds of nitrate of soda per acre; or in place of these 25 tons of decomposed stable manure will be beneficial if the soil is light. In addition to their value for supplying plant food, the chemical fertilizers have an additional value, which is, perhaps, equally important, as, by supplying soluble plant food early in the season, they enable trees to make their growth during the first of the season and ripen their wood thoroughly before winter. The growth is, as a rule, much more firm than that obtained by the use of stable manure, or from the natural fertility of the soil. In fact the chemical manures can be used as correctives, since if those containing potash and phosphoric acid are added to soils that have been highly enriched with stable manure, or that are naturally quite rich in organic matter, they will have a tendency to make the new wood more firm and compact. It can then be claimed that the proper use of chemical manures will increase the hardiness of the trees, and will both render the fruit buds less susceptible to sudden changes in the weather, and lessen the danger of their winter-killing."

These statements, while general rather than specific in character, agree in their main points: First, that orchards should be liberally fertilized; second, in giving preference to artificial manures; and third, in urging that great care be exercised in the use of nitrogen. Those in reference both to the unfavorable effect of too much nitrogen, and to the importance of superphosphate and potash salts, are in a measure verified by the New Jersey experiment already quoted, — that is, nitrogen used alone and, therefore, in excess, was not particularly useful, while the combination of phosphoric acid and potash was more serviceable than any other combination of two elements. The nitrogen was, however, of very great value when used in connection with the mineral elements, as the accompanying statement will show.

VI. — Money Value of Crops, Less Cost of Manure.

	Per year.
Unmanured, 10 years, value of crop, $301.85	$30 18
Nitrogen alone, 10 years, value of crop, $307.30 . . .	30 73

	Per year.
Phosphoric acid and potash, 10 years, value of crop, $725.65	$72 57
Nitrogen, phosphoric acid, and potash, 10 years, value of crop, $810.20	81 02
Annual profit from nitrogen alone	55
Annual profit from phosphoric acid and potash	42 39
Annual profit from nitrogen, phosphoric acid, and potash	50 84
Annual gain from addition of nitrogen to mineral elements	8 45
Annual gain from application of nitrogen alone	55

In this experiment the nitrogen was in the form of nitrate of soda, and because of the ready availability of nitrates was doubtless all absorbed early in the season, and thus did not encourage late growth of leaf and branch.

In this experiment, too, a continuous application of excessive amounts of organic nitrogen, while probably not of the greatest advantage, did not prove detrimental; the wood ripened well and the fruit, while maturing a little later in some cases, was quite as good as that from trees which received the nitrogen in the form of nitrates.

Suggestions as to the benefits of nitrogenous manuring are also furnished by the following examples of actual practice. I note these particular examples, because I have full knowledge of the facts.

One of the most productive and profitable peach orchards in our State is now twelve years old, and at present shows no signs of decay or loss of vitality. This orchard, with the exception of one year, has received annually per acre, since the bearing period at three years of age:

Nitrate of soda	200 lbs.
Ground bone	200 "
Acid phosphate	200 "
Muriate of potash	200 ".

The exception noted is, that one year the nitrate of soda was omitted from part of the orchard; this omission, in the opinion of the owner, resulted not only in a considerable loss of fruit for that year, but in a diminution of the vitality of the trees, which

was very noticeable in the next crop, even though that year fertilized with nitrates as usual.

This orchard is situated in the peach region on soil well adapted for fruits, and was in a good state of fertility when the trees were planted. Orchards in the immediate neighborhood that were planted at the same time, and which were either not fertilized at all, or in a very unsystematic way, have all been removed, either because of the death of the trees, or because the crops received were not sufficient to pay for the labor of caring for the orchard.

It may be well to state, too, that this orchard, consisting of ten acres, has produced eight profitable crops; one crop returned a net profit of $200 per acre, while the average net profit for the whole period of the life of the orchard, now twelve years, is over $50 per acre.

Another orchard, situated on a sandy loam soil, which had been fertilized liberally with ground bone and muriate of potash only, showed signs of decay at the age of nine years. The spring of the tenth year a part of the orchard received, in addition to the bone and potash, 200 pounds per acre of nitrate of soda, and another part was seeded with crimson clover in the fall of the ninth year, which was used as a green manure crop in the spring of the tenth year. The effect of the added nitrogen was very striking, the trees revived, the color of the leaves changed to a dark green, and the fruit increased considerably, so that now, at the age of thirteen years, this fertilization having been continued in the meantime, it presents a healthy and vigorous appearance.

The third example is furnished by a pear orchard of ten acres, which has not missed a full and profitable crop since it came into bearing, now more than ten years, and is fertilized annually with one-half ton of an even mixture of ground bone and muriate of potash; it received nitrogen in the form of nitrate of soda in the earlier stages of its life, while for the past five years the nitrogen has been supplied through the means of green manures.

The practice of the Burlington County farmers is also in evidence as to the benefits of large and continued applications of nitrogen in the form of barnyard manure, since more than one-third of the whole number represented use this exclusively, while nearly all who use it find the practice profitable. It would seem, therefore, that the advantage of nitrogenous manuring is sufficiently well established, and that the chief questions are as to the

kind of nitrogen and the best methods of use. In the first place, the character of the soil must guide here, since soils differ both in their physical and chemical character, and hence in their ability to supply food. Sandy soils with sandy or gravelly subsoils represent a large class; they possess a fairly good physical character, but are very deficient in vegetable matter containing nitrogen, and in the mineral constituents, phosphoric acid and potash. On these, nitrogen supplied in the form of vegetable matter has proved of great advantage, both directly in furnishing nitrogen, and indirectly in improving the physical character of the soil, though it must be accompanied by an abundance of the mineral constituents, phosphoric acid and potash. If applied in the form of nitrate on this class of soils, there is great danger of loss from leaching.

Sandy or clay loams overlying clay subsoils of medium porosity represent another class. These are frequently of good texture, and richer in both humus and mineral constituents than the sandy. With good cultivation fruits make a normal and healthy growth, and do not show the need of nitrogen until crops are harvested; they are then much benefited by it, and it may be most economically applied in the form of nitrates, particularly if added in connection with the mineral constituents, phosphoric acid and potash.

The third class includes those which possess good physical qualities combined with a high natural strength, which comprise a relatively small area. Where such soils have not been subjected for a long time to exhaustive cropping, the growth and development of both tree and fruit proceed normally with minimum applications of manures.

In the second place, the natural mode of growth and development of the tree should guide in the use of nitrogen.

In all cases there should be sufficient nitrogen to provide for an abundant leaf growth early in the season, since the tree and fruit are dependent for food upon both the leaves and the roots. The supply of nitrogen, however, should be limited late in the season, or the foliage will hold too long, with a consequent late feeding, and the result that the new wood formed will lack hardiness and maturity.

Practical Suggestions. — A system of manuring for cultivated orchards, based upon the limited data at our disposal, may be outlined as follows:

To provide vegetable matter and to improve the physical quality of poor soils, apply yard manure once in four years, in fall or winter, at the rate of from five to ten tons per acre. To aid in the decomposition of vegetable matter, and to insure a sufficiency of lime as plant food, apply lime at the rate of twenty-five bushels per acre once in five years. To provide, in addition, an abundance of all forms of available plant food at the times needed for the development of the tree and fruit, apply annually chemical fertilizers in the following proportions:

Nitrate of soda	100 lbs.
South Carolina rock superphosphate	100 "
Ground bone	200 "
Muriate of potash	200 "

The amounts to be applied depend upon the character of the soils, as previously outlined, the kind of fruit, and the age and vigor of the trees; these given, perhaps, mark the minimum.

In a number of best orchards the quantities applied are very much larger than is here indicated, and the larger application is believed by the growers to be proportionately profitable.

By the recent introduction of crimson clover, we have a plant admirably adapted to supply cheaply nitrogenous vegetable matter for orchards, and its growth is to be recommended wherever the plant can be successfully grown, instead of the use of barn-yard manure, particularly upon the poorer soils, until they are abundantly supplied with vegetable matter. The clover should be ploughed down early in the season, in order not to retard the spring growth of the trees. Where the conditions are favorable for the growth of clover, the application of nitrate of soda may be omitted.

I have in this paper presented, as fully as my time allows, what in my judgment seems to be reliable information bearing upon the subject, and a careful review shows that it only emphasizes the statement made in the beginning, that there is urgent need of studies and investigations concerning the food requirements of the various fruits.

Discussion.

Samuel Hartwell asked, "What is the comparative cost of manuring an orchard with barnyard manure and with chemical fertilizers?"

Professor Voorhees replied that twenty tons of yard manure, at $1.50 a ton, would cost $30, while the chemical fertilizers suggested could be bought for $11. In New Jersey commercial fertilizers are relatively cheap and city manures comparatively dear.

Mr. —— Clement said: "The Professor has stated that the life of a peach tree is eight years. Is not that rather a small number?"

Professor Voorhees replied, that it is, but that it is the age at which orchardists in New Jersey generally remove their orchards. It is a shorter time perhaps than it is here or farther south, but with our methods, when no manure or fertilizer is used, it has proved the time to stop.

Mr. Clement further asked whether the yellows were supposed to be helped or cured by the use of mineral fertilizers, to which Professor Voorhees answered, that this point was not borne in mind in the experiments. In some of the orchards which were reported to him as affected, it was found that the apparent yellows were often caused by a deficiency of food or by the root-louse. When a supply of nitrogen was given the yellow color usually disappeared and the tree assumed a healthy growth.

Being asked, "What proportion of nitrogen should be put into an application of wood ashes?" Professor Voorhees said that he would not recommend a mixture of nitrogenous matter and wood ashes, but rather that the ashes be applied in the fall at the rate of one ton per acre, and that the nitrogen be applied in spring in the form of nitrate of soda; as a rule the application should not exceed one hundred and fifty pounds per acre. An excess may give too much leaf growth. Nitrate of soda carries sixteen per cent of nitrogen, so that there are twenty-four pounds of nitrogen in this application of one hundred and fifty pounds of nitrate of soda. Apply as early as possible, so that it may be in the tree in July. Turn green manure under very early — before June — for the same reason.

Thomas Harrison asked about applying nitrogen early in the life of the tree, and whether the amount given and the form of application should be varied in different years.

In reply Professor Voorhees said that there had been experiments on that point and that an excess of nitrogen gave more leaf and wood growth than was necessary, and the wood had to be cut back. Two hundred pounds of nitrate of soda per year seems to be too much to apply. He would not usually apply nitrogen before the trees begin to bear, but on very poor soils would apply it.

Notice was given of an extra meeting to be held on April 11, when William C. Bates would read a paper on "Mushrooms, Edible and Poisonous."

An invitation was also read from Samuel Henshaw, Secretary of the Boston Society of Natural History, to attend a meeting of that Society, Wednesday evening, April 1, when Professor William Libby would read a paper on "The Hawaiian Islands."

BUSINESS MEETING.

Saturday, April 4, 1896.

A duly notified Stated Meeting of the Society was holden at eleven o'clock today, the President, Francis H. Appleton, in the chair.

Hon. George Heywood, from the Committee to prepare a memorial of the late Hon. John P. Spaulding, presented the following:

Massachusetts Horticultural Society, April 4, 1896.

The Committee appointed to prepare and present resolutions on the death of Hon. John P. Spaulding have attended to that duty and report:

Whereas the Massachusetts Horticultural Society has learned of the sudden decease of one of its members, the Hon. John P. Spaulding, of Boston,

Resolved, That the Society would most reverently recognize the wise though mysterious will of Providence by which it has been so recently deprived of one of its members.

Resolved, That this Society has lost a highly esteemed member, who by his many exhibits manifested a great interest in the

objects, usefulness, and prosperity of the Society; his beautiful grounds, filled with the choicest fruits, flowers, and vegetables, show that he was an ardent and scientific amateur in horticulture. In his death not only has this Society, but the community at large and the Commonwealth, city, and country, in many of their interests, lost a most estimable friend and a highly valuable citizen.

Resolved, That this Society tenders to his relatives its heartfelt sympathy in this their deep bereavement.

J. H. Woodford,
George Heywood,
Edwin A. Hall,
Committee.

The memorial was unanimously adopted.

The President read a letter from F. L. Harris, of the Committee to prepare a memorial of the late C. M. Atkinson, stating that the Committee had been unable to perform that duty and asking further time, which was granted.

The President laid before the Society two pamphlets on the diseases of Carnations, presented to the Library.

The following-named persons, having been recommended by the Executive Committee for membership in the Society, were, on ballot, duly elected:

William Caleb Loring, of Beverly.
Frank O. Carpenter, of West Roxbury.
Charles Jackson Dawson, of Jamaica Plain.
Mrs. William Farnsworth, of Dedham.

Adjourned to Saturday, May 2.

MEETING FOR LECTURE AND DISCUSSION.

Saturday, April 11, 1896.

A meeting for Lecture and Discussion was holden today at eleven o'clock, the President, Francis H. Appleton, in the chair.

The following paper was read by the author:

Mushrooms, Edible and Poisonous.

By William C. Bates, Vice-President of the Boston Mycological Club, Boston.

The Massachusetts Horticultural Society has now for many years devoted its resources and expert knowledge to the development in this community of a higher intelligence in regard to the growth, propagation, utility, and beauty of all forms of vegetable life — vegetable in its widest sense, including fruit, flower, and plant, and all the products of the vegetable kingdom. The time, intellect, and money of the Society have been devoted to these ends, that the life of man may have a wider, fuller, freer existence, and that his spiritual sense may be quickened by the revelation of the beneficent bounty of the all-mother Nature, and that the stress of man's daily wants may be somewhat lightened by the increased yield in quality and quantity of Nature's products.

It seems eminently proper, in view of this chosen work of the Society, that we should spend the hour in consideration of one form of vegetable life, Native Fungi, which, it is claimed, has within its own field great possibilities of beneficence in its adaptability as nourishing food for man. It has been well said that "he who makes two blades of grass grow where one grew before" is a benefactor of the race; it follows, then, that the revelation to the people of this country that tons upon tons of nutritious diet are spontaneously produced by nature and await each year man's consumption, is the duty of the mycologist and of every one who loves his fellow men.

We will consider the subject, Mushrooms, Edible and Poisonous, almost entirely from an economic point of view — that is, in relation to their value as a food product and in regard to their varieties and abundance in all parts of our country. Botanists have, for about a hundred years, been engaged in analyzing and classifying the fungi until upwards of one thousand species have been ticketed and labeled with scientific names, but it is only within fifty years that much attention has been paid to the esculent qualities of mushrooms, and much progress has been made in very recent years. Indeed, a dozen years ago there were probably not a score of mycophagists in England and America, — that is, persons who knew by their own experience the value of several species of mushrooms for food — eaters of mushrooms.

Mushrooms have been eaten since the earliest times, especially

in early Roman times, and have been used in large quantities and in considerable variety for two or three hundred years in Italy, France, Russia, and Germany. The common people of France and Italy depend upon mushrooms to supply their table at certain seasons of the year, and seem to have an intuitive knowledge of the edible species, although from ignorance of recent investigations mistakes still occur in those countries with fatal results. Mushrooms are gathered in the Himalayas and the Vale of Cashmere, dried, and shipped to Europe; Japan exports large quantities to China; Patagonians have them for an exclusive diet during part of the year; in New Zealand and Australia the consumption is very noticeable, and yet in this country the use of mushrooms has been confined to a very limited area, and until within a few years to a single species, and that not one of the most conspicuous, or, in the opinion of many mycologists, the most valuable, the mushroom of commerce, *Agaricus compestris*, with its several varieties. The reason of this is not far to seek: First, this mushroom is almost the only one, so far, which lends itself to artificial propagation, and so has become more generally known as an edible species than any other; and, second, because of a wholesome and necessary fear of bad results from eating poisonous mushrooms, for it is known to all that some are very injurious if eaten; in point of fact it is probable that every year there are from twenty to thirty deaths in the United States from this cause alone.

It may be argued from this that if the use of our native mushrooms is made more general and popular these fatalities will largely increase, and so instead of a blessing this new food product will prove a curse. This would undoubtedly be the case unless the knowledge of the poisonous species goes before and follows and surrounds all acquaintance with mushrooms, and this knowledge it is the aim of mycologists (and, it seems to me, of this Society) to make prominent and foremost in all speech, writing, or object lessons, by exhibition or photograph given upon this subject. It is necessary that the student of this subject shall be first frightened to death that he may afterwards rise into peace and satisfaction and eat his mushrooms without fear and trembling. How can this knowledge be obtained? Is there any rule or guide by which poisonous mushrooms can be known at sight and all danger eliminated, so that we may go forth into the fields or woods and

gather mushrooms in safety? There is but one way — we must *learn to know them;* that is, we must learn to know at sight certain edible mushrooms, and in the same way learn to know the poisonous species; there is no other way to pluck the flower safety from the nettle danger. This knowledge is not so difficult of acquisition as it seems; it is much easier than it was a few years ago. In recent years upwards of two hundred species of mushrooms have been tested, identified, and branded for all time and for all climates as edible, but perhaps the most notable service in this direction is the running to earth of the archenemy of all, the "deadly Amanita." To this species all the fatal results of mushroom poisoning are traced; it follows that if we can banish this species from our diet comparative safety is assured. It is due to Capt. Julius A. Palmer, Jr., to say that this segregation of the Amanita as the one cause of all mushroom poisoning has been for many years the burden of his speech and writings upon mushrooms; we owe much to him that it is now generally admitted that the Amanita is *the* one particular genus to be avoided, tracing to it most of the fatalities. This has come, too, not only from tracing to this species most of the cases of mushroom poisoning, but from failure to trace such fatalities to other species. This is not to say that all other mushrooms are edible; there are others that will be injurious, and others unfit for food; therefore it remains that those which are edible must also be learned "by heart," as we used to say in school; that is, to be known at sight. It would seem that if we have learned to know the Amanita, half our battle with ignorance is already won, and we are on the road to safety in gathering mushrooms. Let us see what progress we can make in this knowledge today and now.

Before turning to the photographs as aids in identifying the various species of mushrooms both edible and poisonous, let me recall the principal divisions of fungi which are to furnish this abundant food product of the twentieth century. There are the mushrooms with gills, laminæ, or plates, the most abundant and common form being the Agarici, known to all; mushrooms with pores on the under surface, the Boleti and Polyporæ; mushrooms with spines; and the miscellaneous, such as the Puffballs and Coral mushrooms. The Amanita belongs to the first class, the Agarici; it follows therefore that in the other species we are free from its dangers, though we shall have still to learn which of the

Boleti are fit and proper for food, and so with the others. The Agarici, or mushrooms with gills, are a large family, and we cannot part with them all on account of the Amanita, but must learn to get rid of it from our collections, leaving us free to gather the great variety of gilled mushrooms which are edible.

This brings us to some consideration of the manner of growth of mushrooms in general and of the Amanita in particular. Mushrooms may be considered as the fruit of the plant itself, the plant being a thread-like substance out of sight below the surface; the fruit is nature's method of maturing and distributing the seed or germ of new life, spores.

Mr. W. Hamilton Gibson, in his recently published work "Our Edible Mushrooms and Toadstools," has made all who follow him on this subject his debtors, and we shall have occasion to draw often from his beautiful and life-like plates, as well as from Captain Palmer's "Mushrooms of America;" from the Government reports of the Division of Microscopy, Department of Agriculture, and the English works of Mrs. T. J. Hussey and Rev. M. C. Cooke.

In a plate of Mr. Gibson's book we see the thread-like plant, the mycelium of the mushroom. At times, after rains or in the proper conditions of heat and moisture, the growth is quickened and these little knobs begin to grow and soon push above the surface with the appearance of a small egg. The successive stages of growth are well indicated in another of Mr. Gibson's drawings; in the first stage, the mushroom is enclosed in an envelope which is soon ruptured, but the envelope or volva leaves behind it, in the Amanitas, several indications of its presence, and these may well be called Nature's danger signals. As the mushroom grows a portion of the ruptured envelope adheres to the cap, another portion connects the cap at its edge with the stem, and another part remains at the base, a cup or sac from which the stem rises. As the cap expands these scales or warts remain upon the cap, the veil falls away from the cap and surrounds the stem, the sac remains at the base, and we have the complete *Amanita vernus*, a deadly poison, which Mr. Gibson has appropriately marked with the death's head and labelled "poison." This mushroom is one of the most attractive in appearance, pure white without distinct odor; it is very common, generally accompanying edible species, and would be likely to be the first selected

by the untrained person. The scales upon the top of the pileus or cap are missing at a later stage of growth, or would be rubbed off by contact; it will be seen therefore that if this mushroom were plucked by cutting above the volva at the base and placed with edible varieties it might give no indication of its deadly character and presence; hence the impossibility of accepting a miscellaneous basket of mushrooms without a certificate of character or an expert knowledge of what is not and cannot possibly be an Amanita. The rule of safety is, all Amanitas grow from a volva or sac, some of this genus are poisonous, therefore gather no mushrooms growing from a volva or sac. If there are scales upon the cap and a veil-like ring and the color is, as we have learned it, pure white, scarlet, orange, or yellow, we should look for the cup, and, as it is not always visible above the ground, pass the knife below the surface, taking care to lift the whole; we shall soon learn to recognize the Amanita family at a distance and keep them there. The *Amanita vernus* is pure white, but *A. muscarius* is orange, yellow, or scarlet, with scales or warts upon the cap, a distinct veil or ring and a volva, although Mr. Gibson notes it as often absent, indicated by a mere ragged line of loose, outward curved, shaggy scales around a bulbous base. Captain Palmer portrays it (the volva) as quite distinct. Probably both are right at different stages of growth. The student should not be content with verbal description, but should turn to the colored plates now available, become familiar with the named varieties as exhibited, — and for that purpose the exhibitions of this Society are invaluable, — and, if possible, when learning to know mushrooms, he should have in the season the practical instruction of an expert friend.

Now let us turn to a pleasanter phase of our subject, and consider some edible species which cannot possibly be mistaken for poisonous varieties. The number of edible species is much larger than is generally supposed; upwards of two hundred have been catalogued, and any mycologist should have an eating acquaintance with from fifty to one hundred kinds. The plate of twelve edible mushrooms from the report of the Agricultural Department for 1894, by Dr. Taylor, may fairly be put before the student as his task for a single season. If he accomplishes this, nature will ever after have a new meaning to him, and he will go forth to the fields and woods with a double and quadruple interest; his eyes will be

opened to new botanical wonders, and he will have a new appreciation of the bounty of Nature to her foster child, man.

[After these general remarks, the lecturer proceeded to describe carefully some of the leading species of edible mushrooms. These descriptions were made more interesting by the use of stereopticon illustrations.]

Agaricus campestris. The Meadow Mushroom. — There are many persons who will recognize this mushroom as the only one which they know and gather for food. *Agaricus campestris* is the most widely known, and by some thought to be the best of our native edible mushrooms. The new mycologist has no enmity to this well-known species; he simply claims that it is one of the many, and this knowledge is by no means as common as it should be. It may soon be learned, and ever afterwards be recognized at sight. It grows in open grassy places in fields and pastures, but not in the woods. The cap is whitish rather than white; brownish rather than brown; the gills beneath the cap, in its best condition, are pink, but soon become a dark brown; the margin of the cap extends a little beyond the extremity of the gills — folds over them, we might say. The flesh inclines to turn pink when broken; the stem has a woolly ring or veil. There are many varieties of this species, but none surpassing the *campestris* in flavor.

Agaricus arvensis. The Horse Mushroom. — This species is almost as common in the wild state, and more frequently met with, I think, in cultivation, as it grows much larger, and so yields a better return in weight. The comparative merits of the *campestris*, and several of those we have under consideration today, will not be settled for a long time. There are two sides to the shield; there is room for all in the gastronomic menu. The peculiar flavor of the *campestris* has come to be known as *the* mushroom flavor, but there are some to whom it is not agreeable, and they say, "Oh, I don't care for mushrooms." As well say, "I never eat meat," because the flavor of mutton is not agreeable. Mycophagists claim that there is as much variety in the flavors of mushrooms as in those of meats.

Tastes vary; it is said that in Rome the public censor or, whatever may be his title, the official inspector of mushrooms, condemns to the Tiber our favorite *Agaricus campestris*, but this may have been changed long ago. It hardly seems possible, for this species is known and used in Europe, Asia, and Australia. Its popularity

is increased, no doubt, by its being so easily recognized when once its characteristics are familiar, but the Common Mushroom is one of many, and we must pass on to other species.

Agaricus gambosus. St. George's Mushroom. — This mushroom will interest us as being due in April; in England it is called St. George's mushroom from the date of its appearance, St. George's Day, April 23. Whether this mushroom appears in this vicinity or not, our interest in the subject is too recent for us to have ascertained. Mr. Gibson speaks of it as common in this country; it is specially noticeable for its rank odor. The cap is from three to six or eight inches in diameter, first convex, then expanding and cracked; the color yellowish white, suggesting soft kid leather; the gills crowded, yellowish white, moist, of various lengths, and joined to the stem by a sharp downward curve; the stem stout and solid. It grows in fields, lawns, and pastures in rings or crescents, much like the Fairy Ring mushroom. Dr. Badham reports collecting from a single ring ten or twelve pounds, and in one field about twenty-five pounds of this mushroom. Farmers, ignorant of the economic value of this crop, take pains to eradicate it, fearing injury to the grass; how much better to take it home in a basket for the table, for themselves and neighbors. This mushroom, coming so early, growing in rings, having white gills, and a powerful odor, could hardly be mistaken for any other. Let us hope some one will report it as found in this vicinity before the end of April of the present season. Dr. Badham recorded: "It is the most savory fungus with which we are acquainted." Cooke gives an appetizing receipt for cooking St. George's mushrooms: "Place some freshly made toast upon a dish, and put the Agarics on it, pepper and salt and put a small piece of butter on each; then pour on each one a tablespoonful of milk or cream, and a single clove to the whole dish. Place an inverted basin over the whole, bake twenty minutes, and serve without removing the cover until it comes to the table, so as to preserve the heat and aroma."

Robinson adds: "A great quantity of gravy comes out of it, mingled in a good specimen with osmazome, which tastes very much like the similar exudation on the surface of a roast leg of mutton."

Agaricus ulmarius. The Elm Mushroom. — This mushroom appears on elm trees, sometimes in dense masses, is edible and

very palatable when young and therefore tender. A large mass was observed last summer on an elm tree in the yard belonging to the house of a club near here, whose members would presumably have enjoyed the succulent dish. The manner of growth of this mushroom is sufficient for identification.

Of a similar character is *Agaricus ostreatus*, the Oyster Mushroom, sometimes called the Vegetable Oyster. It is usually found in large clusters upon decaying stumps, joined sidewise to them by a short stem. Clusters of several pounds weight may be gathered from a single stump. The color is dull yellow or ash color, the gills dingy white. When young and tender this mushroom may be cooked in any way one would cook oysters, and the result will be equally agreeable and nutritious. Mr. Gibson has only seen this mushroom in autumn, but Dr. McIlvaine speaks of finding it from March until fall.

Agaricus cretaceus. The Chalk Mushroom. — This is a pure white mushroom growing on lawns and rich grass plots — never in woods. The cap, first globular, afterwards expands, becoming dark and smoky. It is quite brittle and the cuticle peels easily; the stem is hollow and parts easily from the cap without breaking the gills, a strong feature in identification. The flavor is mild. One should become acquainted with this species, though it is not so valuable or plentiful as some others that we have discussed.

Lepiota procerus. The Parasol Mushroom. — This mushroom is often described by enthusiasts as the best of all. The genus Lepiota is distinguished by a well developed ring, which soon breaks loose from its attachment and falls down, or may hang down upon the stem. The cap is distinct from the stem, that is, not joined to it by the gills, the stem being inserted in the cap in a distinct cavity or depression of the cap. The parasol has a dry, clean cap three or four inches in diameter with a distinct protuberance in the centre of the top; it is brown in color and has reddish brown scales dispersed somewhat regularly upon the upper surface of the cap. The stem is slender and five or six inches long, swollen at the bottom to a bulb; but without a sheath or volva. The gills are white; the smell and taste are pleasant and nutty. It grows singly in the open fields, sometimes under trees or by the roadside, and is found in summer and early autumn. The flesh is firm and, including the gills, of uniform thickness from stem to rim or from centre to circumference.

Two other species, *L. rachodes* and *L. Badhami*, are common in this vicinity, and are both edible. The parasol mushroom is best broiled quickly and seasoned to taste, while the *Badhami* or Saffron Lepiota is better stewed, when it yields a dark rich gravy. The Woolhope Club has recipes for Procerus pie, potted Procerus, Procerus ketchup, Procerus omelet, scalloped Parasol, Parasol sauce, etc.

Coprinus comatus. The Shaggy Mane Mushroom. — This species will always have a special attraction for me, it being the first mushroom which revealed itself to me after my eyes were opened to the possibility of learning to know for myself at least several species of edible fungi. There is no mistaking this mushroom for any other, and, if found in proper condition, that is, not too young or too mature, it would be folly to leave it ungathered. This mushroom has been called "the 'fungus of civilization,' as it is generally found near human dwellings." It seems to thrive on made land, possibly on account of the coal ashes frequently used for filling; consequently we find it on city and suburban lawns or vacant lots; generally on a rich surface of loam, but on new or made ground. It is generally found in clusters, though often springing up singly over a considerable area. Appearing above ground in shape like a pigeon's egg, of a dirty white color, as it develops it becomes elongated and cylindrical, five or six inches in height. The cap does not expand, its shape remaining that of an inverted tumbler; the top is covered with shaggy scales or threads. As the mushroom matures it melts into an inky fluid and sinks into the ground; even when gathered, instead of drying up, if left to itself it deliquesces into a dark slimy mass. In its perfect state the gills are white or of a rosy tinge, soon turning purple and black and so into an inky fluid. This mushroom has good edible qualities; it should be cooked soon after gathering — within twelve hours at least. The flavor is most rich and its texture most delicate when the gills show a pink color, with the margins turning to sepia. There seem to be two seasons to the Coprinus — at least to *C. comatus* — the latter part of May and early in June, and again in September and October, the autumn supply being much the largest. This shaggy mushroom is best cooked, I think, by stewing in milk or cream with butter, pepper, and salt.

Coprinus atramentarius, the Inky Mushroon, *C. micaceus*, and *C. congregatus*, were also mentioned.

Marasmius oreades. The true Fairy Ring champignon. — This is an edible mushroom of such marked characteristics as to be easily recognized. It flourishes in pastures with short grass, by the roadside and on lawns; never in the woods. It grows in rings, is of a bright buff color, somewhat tough, and with a solid stem. The gills are wide apart, ten or twelve to the inch, and of cream color. All authorities agree that this Fairy Ring mushroom is of excellent flavor. It may be dried and kept for years; it is sold in the London markets, being often picked by the bushel in England. The size is one or two inches in diameter, and when mature, in the centre of the top of the cap is a tiny elevation or mound. The gills curve upward and are quite free from the stem. Some mycologists think this the best of all mushrooms. It is the one referred to by Shakspeare in:

> "The nimble elves
> That do by moonshine green sour ringlets make
> Whereof the ewe bites not, whose pastime 'tis
> To make these midnight mushrooms."

The rings in which this mushroom grows widen from year to year and have been observed three hundred feet in diameter. This is a summer mushroom, extending sometimes into the early autumn. Very little care will serve to distinguish the true Fairy Ring mushroom from a relative which is not edible, the *Marasmius urens*, whose gills are crowded together, turning brown, and whose stem is more or less covered with down, especially at the base. The *M. peronatus*, another poisonous champignon, is found only in the woods. It has spines at the base of the stalk. These two species should be avoided.

The Russulas comprise a large family of edible mushrooms and when once learned are easily recognized. They are abundant in most parts of the country. They belong to the Agarics, having gills, — most species having even gills, that is, the same length, extending from the stem to the edge of the cap. The substance of the cap is quite brittle; the stem short and stout, solid, and tapering toward the base; no sign of a veil or volva at any stage. The taste, raw, is sweet and nutty; the color of the cap may be green, purple, pinkish gray, and various shades of red; the gills are

generally white or pale cream color. There are two special things to be avoided in gathering Russulas; this genus is in special favor with insects, and frequently it seems as if every one was infested in this way. The fastidious will reject all with any appearance of insect occupation, and this may occur between the time of picking and cooking; hence attention must be given to this at the last, just before cooking, by cutting in sections. The other difficulty in gathering Russulas is the danger of picking a noxious species, *Russula emetica*, the effects of which would at least be very disagreeable, and there is at present just one way recommended for detecting the presence of this species, viz., to taste a small piece of each specimen picked. *R. emetica* has an unmistakable hot, peppery taste, and must, of course, be thrown away. The Russulas are so abundant in woods from July to September and of such appetizing flavor when broiled, baked, stewed, or eaten raw, as to be well worth identification.

Lactarius deliciosus. The Orange-Milk Mushroom. — The milky mushrooms are a very common genus in our woods in July and August; they have the characteristic of exuding a milky juice unmistakable when seen. Several of the brown species are edible, and one of the most common, white and with gills very fine and close together, like a fine tooth comb, which is very liberal with its bitter acrid milk, is quite edible, its acridity disappearing in cooking. The most attractive of the milky mushrooms is *Lactarius deliciosus*, the Orange-milk mushroom. The cap is from three to five inches in diameter, and is generally of a dull reddish orange color, with banks or rings of darker red. The flesh, when bruised, exudes a juice of orange color or deep yellow, gradually turning green on exposure. It is found in woods, pine groves, and swamps from July to September. The taste when raw is slightly acrid, but this disappears in cooking. This is considered by all acquainted with it one of the most delicious of our edible mushrooms. I regret that my only summer of search has not brought it to my personal knowledge.

Hypholoma sublateritius. The Brick-Top Mushroom. — While many mushrooms are edible and should be sought after by those desiring additions to the larder, either from necessity or from epicurean motives, there are others which are not important enough to lead us to expect they will become a feature of the markets, owing either to their comparative rarity or lack of decided value.

The *Hypholoma sublateritius*, the Brick-top mushroom, may be classed in the latter category, though those familiar with its edible qualities will not pass it by. It grows in clusters upon or around stumps or on the ground covering decaying wood, and is found in the late autumn. The cap is of brick red color with paler edges; the gills are at first of a dull white, turning to olive green. It is slightly bitter when uncooked, but is excellent when stewed with butter, pepper, and salt and served on toast. It is often found after frosts, perhaps covered with leaves at the base of a stump.

Cantharellus cibarius. The Chantarelle. — If any mushroom deserves the title of Royal it doubtless should be given to this Chantarelle. Nero is said to have declared the *Amanita Cæsarea* to be food for the gods. Battara, an old writer on fungi, remarked, that "if properly prepared, the Chantarelle would arrest the pangs of death." This mushroom is of golden yellow in all its parts, like the dark yolk of an egg. It is about two inches in height and about the same in breadth, conical or funnel shaped. The flesh of the cap is firm and thick; the stem is of the same substance and equally good to eat. Instead of gills the under surface is composed of thread-like veins running down the stem, with smaller veins running transversely. The odor is delicate, like ripe apricots or plums; the flesh white, tinged with yellow. This Chantarelle may be stewed, fried, or broiled, combined with the meat of chicken or used in soup; in fact, it can hardly fail to excite the enthusiasm of the epicure. It grows profusely wherever it is found, generally in light woods and partially covered with leaves. My own particular preserve is within four miles of the State House, and the Chantarelle is found there from July to September inclusive. It may be readily dried for use in winter, and when one reflects that within the bounds of New England large quantities of this delicious mushroom must go to waste every year, utterly unknown and uncared for, it would seem as if a reward should be offered for its discovery and shipment to market.

There is a false Chantarelle, *C. aurantiacus*, growing in grass, in open places; not egg yellow, but reddish orange in color; the gills more like true gills than veins. In another species the gills are almost white, but neither of these would be mistaken for the true Chantarelle by one to whom it had once been familiar.

Boletus edulis. The Edible Pore Mushroom. — The name Boletus is now applied to those mushrooms which have a soft flesh

with vertical tubes underneath the cap. The tubes are round or angular; the cap horizontal and fleshy.

The *Boletus edulis* can hardly be mistaken for any other; the surface of the cap is smooth, the flesh white and unchanging; the tubes first white, then pale yellow, and later greenish yellow; the stem solid and quite thick. It is found in spring, summer, and autumn in pine, oak, and chestnut woods. It is sold in quantities in Italy, Germany, and Russia, and is dried for winter use, making an excellent soup. It is usual in England to cut away the porous under surface, using only the fleshy cap, but in young specimens, only two or three inches in diameter, the whole cap, including the pore surface, may be gathered and eaten. These Boleti may be found six or eight inches in diameter; young and smaller specimens are the best; "about the size of a penny bun" is the English standard. They remove the stem and pores, cut the fleshy cap into small pieces, place it in a covered dish with butter, pepper, and salt, and bake for an hour.

There are several species of edible Boleti, and it is noticeable that some which were condemned a few years ago are now known as edible. Such is *B. subtomentosus*, the flesh of which turns blue upon fracture, but there is no longer any doubt of the edibility of the species. Dr. Curtis placed it in his list long ago, and it has been often tried by Captain Palmer and Captain McIlvaine. Some mycologists incline to the opinion that all Boleti are edible if gathered in the proper condition; it is certain that a great number of valuable species are going to waste each year, from lack of attention by our people.

B. alveolatus and *B. felleus* are placed by Gibson among the suspicious Boleti. These may be easily avoided by amateur collectors, *B. alveolatus* having a crimson or a maroon cap, the tube surface the same, and the stem mottled yellow, red, and maroon. *B. felleus* has a pinkish flesh and is extremely bitter to the taste; the tube surface is white to pinkish in color. A sufficient acquaintance with these various Boleti can hardly be made without reference to the colored plates in Mr. Gibson's or Captain Palmers' book.

Strobilomyces strobilaceus. The Cone-like Boletus. — Another edible species which cannot be mistaken for any of the other Boleti, is the Cone-like Boletus. It is of a brownish gray color and has a shaggy surface with brown or black woolly points, the

pore surface grayish white becoming brown, the substance turning red when broken. It grows to four inches in diameter, and may be dried and kept indefinitely. It its found abundant within a few miles of the State House. Our Italian population have brought with them a knowledge of Boleti.

Lycoperdeæ or Puffballs. — The puffballs are easily recognized and cannot be mistaken for species of any other genus. They are among the most valuable of the edible mushrooms. There are several species, the most common in this section being *Lycoperdon saccatum*, with a diameter of three or four inches. It is filled with a soft white flesh when immature and at its edible stage ; it changes to an elastic yellowish brown, cottony, and dusty mass, including the spores, which are soon blown broadcast by the winds. The Giant Puffball, *L. giganteum*, attains a diameter of one and even two feet. This mushroom is cooked by frying in a batter of egg and bread crumbs, or it may be stewed with some other mushroom, of which it will absorb the flavor. Puffballs must be gathered young, while they are white and pulpy ; if turning yellow or powdery they are too old for use. It is the abundance of this mushroom in many parts of the United States which gives force to the assertion of mycologists that tons of good food go to waste annually in the United States. Puffballs are found from July to September in closely cropped pastures ; sometimes in meadows and gardens. Dr. Curtis wrote of this fungus : " It is a general favorite with me, as it is indeed of all my acquaintances who have tried it. It has not the high aroma of some others, but it has a delicacy of flavor that makes it superior to any omelet I have ever eaten. It seems, furthermore, to be so digestible as to adapt itself to the most delicate stomach. It is the South Down of Mushrooms."

Fistulina hepatica. The Beefsteak Mushroom. — This mushroom is found on the stumps of oak, ash, and chestnut trees and probably approaches animal food more nearly than any other fungus. It is interesting to note that this species frequently appears from year to year on the same stump ; it is well, therefore, " when found to make a note of it." It appears at any time during the summer season and grows to a tongue or palm shape, having the color of liver or beet, the under side being a pale yellow. It is attractive in appearance when in good condition and, as we say, " looks good enough to eat." When young it should be

sliced and broiled like steak, or minced and stewed. It lends to the homely hash an ethereal flavor which cannot fail to charm the summer boarder, and it also yields a voluptuous gravy which would have raised the spirits of Mrs. Todgers had she only known of it in her day. It is not a rare mushroom in this vicinity; the open eye will scarcely fail to meet it on any walk through woods abounding in stumps; "it varies in size from a few inches to several feet in circumference. A well-known mycologist, Mr. Bulkley, observed a specimen weighing twenty pounds; it has been called the poor man's fungus." This mushroom is utterly unlike the type ordinarily associated with the name; the under surface is like the Boleti, having pores or tubes closely joined but separating easily, and as small as pin holes. One of the best features is that this species is usually free from larvæ or insects. It projects from the stump without a stem, much as the pod of cocoa grows on its birthplace, and has more the appearance of a shelf.

Morchella esculenta. The Morel. — Another spring mushroom, found in many parts of the country, is the Morel, *Morchella esculenta.* This species differs materially in form from any of the before mentioned types. The whole plant consists of a cap and stem, but is quite different from those of the Agarics, Boleti, or Hydnei. The cap is deeply pitted on the outside with pits or hollows, the flesh being no more than an eighth of an inch thick. The method of bearing spores is unique, but the limitation of our subject will prevent a consideration of that phase. The Morels are all edible and are common in the markets of Paris in June. They are used in a dried state in London, and they should be better known in this country, as they are considered a great delicacy, and certainly grow in Massachusetts. The Morel is found growing in orchards, and is said to thrive in made land where ashes have been used for filling. It appears late in April and until June, and may be dried for later use. The hollow shape suggests a variety of methods for cooking. In Italy they are usually cut in pieces and stewed. Dr. Badham suggests filling the cavities with a stuffing of veal. Let us hope the time will soon come when this appetizing food product will not be left to go to waste. It is said in France that the Morel may be cultivated.

Hydnum repandum. The Hedgehog Mushroom. — This is a spine-bearing mushroom, as the genus Hydnum has spines instead of gills or pores, and so is easily distinguished. As we have shown

there can be no danger of poison in any of this genus. One of the most common, *Hydnum repandum*, is found in woods in the autumn. The cap is irregular in shape, depressed in the centre, and of a pale yellow; underneath the cap are the spines, crowded and running downwards, somewhat paler than the cap. The stem is solid, at first white, then turning a cream color, and is generally quite short. Ten or more may be joined together, by which the caps are irregularly formed. The flesh is thick, and the supply is quite plentiful in autumn. It may be sliced and dried and so made suitable for winter use. This species is in general use in France, Italy, and Germany, and is well known in England. There can be no doubt of its value as food, and it is equally certain that there is a large supply going to waste in this country from the lack of knowledge of its value. Uncooked, this Hydnum has a slightly pungent taste, and Dr. Cooke recommends its use in a sandwich instead of mustard or peppergrass. The Hydnum being dry and inclined to toughness should be cooked slowly. Dr. Badham finds them to resemble oysters in flavor. They are called Doeskin mushrooms in England and also Hedgehog mushrooms. There are several species of Hydnum, all edible; some grow upon wood; some from the ground in woods. One is called *H. coralloides*, and is described by Professor Peck as being abundant in mountainous districts from August to October.

Mr. Gibson describes at length *H. caput-Medusæ*, the Medusa's Head mushroom, and regrets having neglected to gather a fine bunch through ignorance, only to learn from Dr. Harkness that he "had thrown away five pounds of the most delicious fungus meat known to epicures."

Polyporus sulphureus. The Sulphurous Polyporus. — This is one of the many pored fungi; its color is a very striking feature, and it must have been seen by many of those accustomed to take their walks abroad through woods or to drive over shaded roads. How many have known it for a choice edible mushroom? It is not specified in the English works so far, I believe, but is well known to American mycologists. It is of a brilliant sulphur-yellow or orange-salmon color, growing in dense clusters upon a log, stump, or fence, — generally upon wood beginning to decay. Mr. Gibson speaks of a specimen weighing ten or twenty pounds. A young specimen is delicious and wholesome; the texture varies with age and becomes tough and woody at the base. It is easy, however,

to recognize the edible portion and proper condition. Some now present may remember a very fine specimen exhibited on the table of this Society last summer. This was tasted by several members of the Mycological Club with very gratifying results. The flesh may be stewed, fried in butter, or eaten cold as a salad, and on the whole may fairly be said to resemble the white meat of chicken. I am inclined to claim for it equal value as food. It is hardly possible to mistake this edible mushroom for any other, and, if not spoiled in cooking, it cannot fail to recompense whomsoever gathers it. Who shall say how many meals for a family go to waste annually within a stone's throw of some family whose worry would have been lightened by a knowledge of the food value of this mushroom?

Helvella crispa.— This mushroom is also little known in this country. It is allied to the Morel, its spores being enclosed before dissemination. The Helvella is an autumn fungus, and all the species are edible and easily recognized by their fluted hollow stem, flexible waxy cap, and the color — cream above and ochre beneath. It grows in woods during the late summer and autumn.

Armillaria melleus. The Honey Mushroom. — The Honey Mushroom is given in the reports of Dr. Taylor as edible. Cooke speaks of it as the most common and the most universally eaten on the Continent of all the stump mushrooms, and yet it has no favor in England; it is so common in this country as to be rated as a nuisance. All writers have placed this among edible fungi, but in the absence of any personal experience we will not insist upon its value as a food product. It is found growing on stumps, frequently in dense clusters, and if growing out of grass there is a bit of rotten wood beneath; the cap is of a honey-brown color and is about two inches across, darker in the centre than at the outer edge; the stem is rather long, paler than the cap, with a large spreading ring near the top. It is this which gives it the name Armillaria — "little bracelet." The spores are white and so profuse that grass, wood, and leaves beneath are soon covered with a coating of snow-white spores; this feature will help in its identification. More testimony is needed as to the value of this mushroom as a food product, though there is no doubt of its being edible, the question being, Is it esculent? This species is very interesting botanically, though this is somewhat apart from our present subject. Botanists have noted that it gives out a phos-

phorescence or luminosity from the mycelium, and that it is a very good illustration of symbiosis, that partnership existence by which two organisms live together for a time; the mycelium of the *Armillaria melleus* entering through the roots of a pine or spruce permeates the cells of the tree until the fungus is the only surviving partner, the tree dying.

A plate in Hartig's "Trees and their Diseases" shows this fungus growing from a pine stump, the tree having been killed by the association. Authorities differ as to its value as food. It seems desirable to have this matter further tested by mycologists, as it is a prolific species.

Clavaria. Edible Coral Mushrooms. — This genus seems to be plentiful in all parts of the country, and it is probable that all the species are edible, as it is certain the white ones are. Its growth resembles coral, and it should be tender and brittle when gathered; not sodden with moisture or yellow with age. It goes without saying that mushrooms are fit for food only when in good condition — that is, before decay has set in and before they are permeated with the larvæ of insects, the latter condition occurring very early with certain species, especially in the Russulas and Boleti. *Clavaria rugosa* is white, with the tips tinted a greenish gray. *Clavaria botrytis* may often be found the size of a cauliflower, with red tips. The Clavariæ are not to be despised or neglected, though they are not so important a genus of edible mushrooms as are many others, and when found in sufficient quantities and in size large enough to be gathered free from dirt are absolutely safe for eating. Timid people may well begin with the coral mushrooms. They may be dried and used in winter and may be fried in butter, stewed like oysters, or eaten raw as a salad. It is not attacked by the fungus worms, and is found in summer and autumn in woods.

These mushrooms now described and photographs of which have been thrown upon the screen are the most common of our native edible varieties, and should become familiar to all our people. The Massachusetts Horticultural Society will do much to extend this useful knowledge of nature's food product by opening its weekly exhibitions to contributions of mushrooms and by the offer of prizes upon special days for collections of named varieties, and this course has been adopted for the current year.

In reply to a question, the lecturer said that edible mushrooms in general are distinctly nutritious — much like meat, and should be considered as more than an agreeable delicacy; not merely as a luxury but as food for the poor, whose burden of providing food would be much lightened if this form were utilized.

CONTENTS.

PAGE

PREFATORY NOTE, ... 3

BUSINESS MEETING, January 4, 1896; Address of President Appleton, pp. 5–16; Appropriations for 1896, 16, 17; Appointment of Treasurer and Secretary, 17; Programme of Lectures and Discussions announced, 17; Annual Report of the Secretary and Librarian read, 17; Reports of Committees on Vegetables and School Gardens and Children's Herbariums read, 17; Vote of thanks to Waldo O. Ross, 17; Committee to obtain portrait of retiring President, 17; Finance and Library Committees authorized to store part of the Library, 17, 18; Vote of Thanks to the retiring President, 18; Letter from Hollis Webster, 18; Two members elected, ... 18

MEETING FOR LECTURE AND DISCUSSION, January 11; Hardy Garden Plants, by E. O. Orpet, pp. 18–29; Discussion, ... 29–31

MEETING FOR LECTURE AND DISCUSSION, January 18; Conservatism in Scientific Agriculture, by Prof. W. H. Jordan, pp. 31–47; Discussion, . 47–49

MEETING FOR LECTURE AND DISCUSSION, January 25; Stove Plants in their Native Tropics, by Prof. G. L. Goodale, ... 49–54

BUSINESS MEETING, February 1; Report of Joint Committee on the Building, and vote passed, pp. 54, 55; Annual Report of the Treasurer read, 55; Committee on School Gardens and Children's Herbariums appointed, 55; Committees to prepare memorials of Charles M. Atkinson and Hon. John P. Spaulding, 55; Invitation from Boston Society of Natural History, 55: Member elected, ... 55

MEETING FOR LECTURE AND DISCUSSION, February 8; Seed Control: Its Aims, Methods, and Benefits, by Gilbert H. Hicks, pp. 56–81; Discussion, ... 82, 83

MEETING FOR LECTURE AND DISCUSSION, February 15; Some Scale Insects, by L. O. Howard, with four plates, pp. 84–96; Discussion, . 97, 98

MEETING FOR LECTURE AND DISCUSSION, February 29; Some Tendencies and Problems in the Evolution of Species among Parasitic Fungi, by Prof. George F. Atkinson, pp. 98–118; Discussion, ... 118

BUSINESS MEETING, March 7; Appointment of Secretary *pro tem.*, p. 119; Report of Committee on Gardens referred to Committee on Publication, 119; Six members elected, ... 119

MEETING FOR LECTURE AND DISCUSSION, March 14; Ornamental Planting for Parks and Public Grounds, by William S. Egerton, ... 119–133

MEETING FOR LECTURE AND DISCUSSION, March 21; Grasses, by Prof. F. Lamson-Scribner, pp. 134–149; Discussion, ... 149, 150

MEETING FOR LECTURE AND DISCUSSION, March 28; Manuring Orchards, by Prof. Edward B. Voorhees, pp. 150–165; Discussion, . . . 166, 167

BUSINESS MEETING, April 4; Memorial of Hon. John P. Spaulding, pp. 167, 168; More time granted the Committee on memorial of C. M. Atkinson, 168; Two pamphlets presented to the Society, 168; Four members elected, ... 168

MEETING FOR LECTURE AND DISCUSSION, April 11; Mushrooms, Edible and Poisonous, by William C. Bates, ... 169–187

EXPERIMENT STATION REPORTS WANTED.

The Massachusetts Horticultural Society is endeavoring to collect complete sets of the Bulletins and other publications of all the Agricultural Experiment Stations in the United States and Canada. Those named below are wanting, and any person having a spare copy will confer a favor by addressing the Librarian of the Society, Horticultural Hall, No. 101 Tremont Street, Boston.

Alabama (Ag. and Mech. College Station). — Bulletins 4–6 (1884), 7–10 and 1–4 (1885), 5–9 (1886). Seventh Annual Report, for 1894.

Alabama (Canebrake Station). — All Annual Reports later than that for 1890.

Arizona. — Fourth Annual Report, for 1893.

Arkansas. — Bulletin 1. All Annual Reports later than the Fourth, for 1891.

California. — Bulletins 32, 1878, and 1, 2, 3, 5, and 50, New Series.

Colorado. — Bulletin 3.

Connecticut (New Haven Station). — Bulletins 1 to 67, inclusive. Annual Reports for 1877 to 1883, inclusive, except that for 1878.

Delaware. — All Annual Reports later than the Fifth, for 1892.

Idaho. — All Bulletins later than No. 9.

Indiana (Purdue Univ. School of Ag.). — Bulletin 1. College Reports 1 to 14, inclusive.

Kentucky. — Bulletin 10.

Maryland. — Special Bulletins G and K.

Michigan. — Sixth Annual Report, for 1892–93.

Missouri. — Bulletins 9, 13, 15, 16, 19, 20, 25, 26, and 33 of the Old Series. All Annual Reports since the First, for 1888.

New Jersey. — Bulletins 1, 4, 5, 15, 27, and 28.

New York (Cornell). — Annual Report, 1882–83 (Report of Agricultural Department of Cornell University).

North Carolina. — Bulletins 1 to 56, inclusive, and 69, 2d ed. Meteorological Division, Bulletin 2 (68*b*), and 2d and 3d Annual Reports, for 1888 and 1889. Special Bulletins 1 (77*a*) and 4 (82*a*). Weekly Weather Crop Bulletins 1–21, 1888; 1–24, 1889; 1–25, 1890; 2 and 4, 1891.

North Dakota. — All Annual Reports later than the Third, for 1892.

Ohio. — All Bulletins of the First Series, except 16, 17, 18, and 19.

Oregon. — All Annual Reports later than the Third, for 1890–91.

Pennsylvania. — Annual Reports for 1869, 1872, 1879–80, 1881, 1882, 1883, 1884, and 1885. [All issued by the State College.]

South Carolina. — All Bulletins of the Old Series (previous to 1888) on the work of the Experimental Farm of the South Carolina College. Third Annual Report, for 1890, and Sixth Annual Report, for 1893.

Texas. — College Bulletins 1–5, 1883–1887.

Virginia. — Bulletins 55–60, inclusive.

Washington. — Fourth Annual Report, for 1893–94.

West Virginia. — Special Bulletin, — Potash and Paying Crops, 1890. All Annual Reports later than the Third, for 1890.

Ontario Department of Agriculture, Toronto. — Bureau of Industries. — Agricultural Returns to the Ontario Bureau of Industries, Nov., 1882 (5th), Aug., 1883 (7th), and Nov., 1887 (20th).

TRANSACTIONS

OF THE

Massachusetts Horticultural Society,

FOR THE YEAR 1896.

PART II.

BOSTON:
PRINTED FOR THE SOCIETY.
1897.

☞ SEE LAST PAGE OF COVER.

TRANSACTIONS

OF THE

Massachusetts Horticultural Society,

FOR THE YEAR 1896.

PART II.

BOSTON:
PRINTED FOR THE SOCIETY.
1897.

TRANSACTIONS

OF THE

Massachusetts Horticultural Society.

BUSINESS MEETING.

SATURDAY, May 2, 1896.

An adjourned meeting of the Society was holden today at eleven o'clock, the President, FRANCIS H. APPLETON, in the chair.

Frederick L. Harris, from the Committee appointed to prepare a memorial of the late Charles M. Atkinson, presented the following report:

Mr. C. M. Atkinson, the subject of this memorial, and for thirty-four years a valued member of the Massachusetts Horticultural Society, was born in Dorchester, England, in 1826, and in early life apprenticed himself to Mr. Campbell, near Exeter, Devonshire; from thence he went to James Veitch's nursery near by, and shortly afterwards assumed charge as foreman at Lord Sefton's, Clevedon. Leaving there he took charge of Pontey's celebrated nursery at Plymouth, Devonshire, where he remained, after marrying, until he decided to emigrate to America. He arrived in New York in 1857, and at once entered the service of Hovey & Co., at Cambridge, whose nursery at that time was celebrated throughout the United States and Europe for its collections of fruits and exotic plants.

Beginning in 1864, he managed the Cushing estate in Belmont three years, when he was appointed Superintendent of Mount Hope Cemetery. Owing to a change of administration there, he took charge of John L. Gardner's estate in Brookline, where he had an opportunity of identifying himself with the best interests of this Society.

As a successful exhibitor he had few equals, and his influence was felt by every one in competition with him. The grand specimens of Azaleas shown by him, six in number, had never previously been equalled by any grower; one of them, Decora, measuring eight feet by six feet. In hardy roses and hard-wooded plants the numerous medals and diplomas gained by him testify to his superior ability. In his death the Society loses one of its efficient aids; for, although considered as belonging to the old school of gardeners, he ever maintained a love for every new introduction, and was ever anxious, by precept and example, to engage others in furthering the objects of the Society.

After a long and active life, his health failing, he resigned his position with Mr. Gardner, January 1, 1895, having held it for a period of twenty-seven years. Marrying a second time, he passed the winter in Washington and returned to Boston in June, when he underwent a surgical operation (the second) and sailed for England. After his arrival there, the old trouble soon manifested itself, necessitating another operation, which terminated fatally. His body was brought to Boston and interred in the family lot in Walnut Hill Cemetery, in Brookline, Thanksgiving Day, 1895.

We are sure the Society will express its sympathy with the widow and only son by sending to them a copy of this memorial.

PATRICK NORTON,
F. L. HARRIS,
KENNETH FINLAYSON, } *Committee.*

The memorial was unanimously adopted.

The following named persons, having been recommended by the Executive Committee for membership in the Society, were upon ballot duly elected:

LANDER M. BOUVÉ, of Brookline,
HENRY R. STEDMAN, M.D., of Roslindale,
MICHAEL H. WALSH, of Wood's Holl,
GEORGE D. MOORE, of Arlington.

Adjourned to Saturday, June 6.

BUSINESS MEETING.

SATURDAY, June 6, 1896.

This was the day to which the last meeting of the Society adjourned, but no quorum was present, and the

Meeting was dissolved.

BUSINESS MEETING.

SATURDAY, July 11, 1896.

A Stated Meeting of the Society was holden today at eleven o'clock, the President, FRANCIS H. APPLETON, in the chair.

The decease of M. Léon Say, President of the National Horticultural Society of France, was announced, and the President stated that he had written a letter to the Secretary of the French Society expressive of the appreciation by this Society of the loss sustained.

The Secretary announced the decease of Andrew S. Fuller, of Ridgewood, N. Y., a Corresponding Member of the Society, and one of the most eminent practical horticulturists in the country, as well as the author of valuable horticultural books, and moved the appointment of a committee to prepare a memorial to him. The motion was carried, and the President said that he would announce the Committee later.

The Secretary also laid before the Society a letter from Mrs. C. M. Atkinson, expressing her gratitude for the testimonial to her late husband, and for the sympathy felt by the Society in the loss which his family has sustained.

A vote moved by Joseph H. Woodford, concerning the compensation of Committees, was referred to the Executive Committee.

The following named persons, having been recommended by the Executive Committee, were on ballot elected members of the Society:

GEORGE E. WHITTIER, of Groton,
E. F. SEARLES, of Methuen,
FREDERICK E. CLARKE, of Lawrence,
MISS ELEANOR J. CLARK, of Pomfret, Conn.

Adjourned to Saturday, August 1.

BUSINESS MEETING.

Saturday, August 1, 1896.

An adjourned meeting of the Society was holden at eleven o'clock, the President, Francis H. Appleton, in the chair.

Agreeably to the Constitution and By-Laws the President announced the following Committee to nominate candidates for Officers and Standing Committees of the Society for the next year:

William H. Spooner, *Chairman.*

Benjamin M. Watson,	Patrick Norton,
Samuel Hartwell,	Henry W. Wilson,
Benjamin P. Ware,	C. Minot Weld.

Adjourned to Saturday, September 5.

BUSINESS MEETING.

Saturday, September 5, 1896.

An adjourned meeting of the Society was holden today at eleven o'clock. The President and all the Vice-Presidents being absent, the meeting was called to order by the Secretary, and Ex-President William H. Spooner was chosen Chairman *pro tem.*

Mr. Spooner, as Chairman of the Committee to nominate candidates for Officers and Standing Committees for the year 1897, reported a printed list, which was accepted, and it was voted that the Committee be continued and requested to nominate candidates in place of any who might decline before the election.

The meeting was then dissolved.

BUSINESS MEETING.

Saturday, October 3, 1896.

A Stated Meeting of the Massachusetts Horticultural Society, being the Annual Meeting for the choice of Officers and Standing Committees, was holden today at eleven o'clock, the President, Francis H. Appleton, in the chair.

The Secretary stated that the meeting had been duly notified to the members of the Society, agreeably to the Constitution and By-Laws.

William H. Spooner, Chairman of the Nominating Committee, reported that that Committee had nominated Arthur H. Fewkes as a member of the Committee on Plants, in place of William Robinson, deceased since the last meeting. The report was accepted.

Agreeably to the Constitution and By-Laws, the President appointed Azell C. Bowditch, Hon. Aaron Low, and A. A. Kingman a Committee to receive, assort, and count the votes given, and report the number.

It was voted that the polls remain open two hours. The polls were opened at ten minutes past eleven o'clock.

The President, as Chairman of the Executive Committee, presented the following report:

At the meeting of the Society on the eleventh of July last, the construction of the vote establishing the compensation of Committees was referred to the Executive Committee. Said vote was passed February 14, 1891, and is as follows:

"One hundred dollars to each of the six Chairmen, and one dollar each for other members whenever they attend as required by the Schedule, an account to be kept by the Chairman."

The Executive Committee report that this subject was brought to their attention at their meeting on the 25th of January last, when they adopted the following vote:

"*Voted*, That in the opinion of the Executive Committee, the construction of the rule is that the one hundred dollars covers all remuneration to the Chairmen of those six Committees."

The Executive Committee have now to report that at their last meeting, on the 25th of September, the subject was again carefully considered, and that they saw no reason to change the position taken on the 25th of January.

The report was accepted and adopted.

Joseph H. Woodford objected to the report, and wished his objection recorded. It is as follows:

By vote of the Society at a previous meeting, voted to pay one hundred dollars for the services of the Chairmen of the working

Committees and one dollar for each committee man when called together by the chairmen.

The Executive Committee have decided not to pay certain members of the Garden Committee for their services on that Committee, and I hereby object to that decision and enter at this time my protest.

JOSEPH H. WOODFORD.

Michael H. Norton announced the decease of William Robinson, and moved that a committee of three be appointed by the Chair to prepare memorial resolutions. The motion was carried, and the Chair appointed as that Committee Frederick L. Harris, Michael H. Norton, and William J. Stewart.

The following named persons, having been recommended by the Executive Committee for membership in the Society, were on ballot duly elected:

CARL BLOMBERG, of North Easton,
HOLLIS WEBSTER, of Cambridge,
JAMES H. DUNLAP, of Nashua, N. H.,
OTIS E. WELD, of Boston,
EDWARD J. MITTON, of Brookline,
MATTHEW S. HIGGINS, of East Bridgewater,
MISS ALICE B. CARY, of Lexington,
ELIHU G. LOOMIS, of Bedford,
WILLIAM S. H. LOTHROP, of Boston,
JEROME JONES, of Brookline,
COL. FREDERICK MASON, of Taunton,
CHARLES H. MOSELEY, of Dorchester,
CHARLES U. COTTING, of Boston,
ABNER J. MOODY, of Boston,
ROLAND W. TOPPAN, of Malden,
FREDERICK STRONG MOSELEY, of West Newbury,
HENRY STURGIS GREW, of Boston.

The polls were closed at ten minutes past one o'clock, and the Committee to receive, assort, and count the votes, and report the number given, reported the whole number of votes cast to be seventy, and that the members named in the ticket reported by the Nominating Committee had a plurality of votes and were elected.

The report of the Committee was accepted, and the persons named on the above mentioned ticket were, agreeably to the Constitution and By-Laws, declared by the President to have a plurality of votes, and to be elected Officers and Standing Committees of the Society for the year 1897.

Adjourned to Saturday, November 7.

BUSINESS MEETING.

SATURDAY, November 7, 1896.

An adjourned meeting of the Society was holden today at eleven o'clock, the President, FRANCIS H. APPLETON, in the chair.

O. B. Hadwen, Chairman of a Committee appointed to prepare a memorial of Andrew S. Fuller, of Ridgewood, N. J., made the following report:

IN MEMORY OF ANDREW S. FULLER.

By the death of Andrew S. Fuller, this Society has lost one of its most valued Corresponding Members, and horticulturists a brother who has devoted a long life to the advancement of both the science and the practice of their art. He was an enthusiast in promoting the cultivation of fruits; and his published works were among the first containing elaborate experimental information relating to the propagation and cultivation of that extensive class commonly known as small fruits, and are justly recognized by the large class of growers engaged in that branch of horticulture as standard works. He has been the means of stimulating the vast cultivation pursued all over our country, and of elevating the industry to its present advanced standard.

Mr. Fuller's work, "The Forest Tree Culturist," is a most valuable acquisition to this branch of agricultural industry, at present in its infancy, but destined, as time goes on, to improve a vast area of land now comparatively worthless. This work has awakened a more general interest, which slowly but surely will benefit the whole country as well as those who are immediately engaged therein. Those of the Society who have personally known Mr. Fuller, and have seen him at the meetings of the American Pomological Society, when being held in Boston and

other cities, remember him as a gentleman of fine and cultivated personality, charming in conversation and anecdote, and abounding in those gentlemanly qualities, gained during a long life among his trees, fruits, and flowers, which rendered him preëminently a benefactor to the horticultural age in which he lived.

Though he has passed away, his works are still with us, to impart practical knowledge not only to the present generation of men, but to generations to come. We mourn his loss not only as a Corresponding Member of this Society, but as an experienced and valued contributor to the advancement of the science and art of Horticulture. His manifold ability and industry have placed him well in the lead of writers on horticultural subjects; and the wide circulation of his books has made him justly renowned. He impressed one as a man who thoroughly understood and enjoyed horticultural life; he was noted for his fondness for giving trees and plants to his friends, and for his readiness ever to extend a helping hand to all striving to advance in horticultural pursuits.

Mr. Fuller was elected a Corresponding Member of this Society in 1869. His memorial is found in our Library not only in his own works, which he sent to it as they appeared, but in a copy of Gerard's "Herbal" presented by him.

O. B. Hadwen,
J. Woodward Manning,
Robert Manning,
} *Committee.*

The memorial was unanimously adopted, and it was ordered that it be entered on the records, and that a copy be sent to the family of Mr. Fuller.

William J. Stewart, from the Committee to prepare a memorial of the late William Robinson, presented the following report:

William Robinson came to this country in 1877, at the age of twenty-six, already favorably known for his skill in the higher branches of gardening, and at once assumed charge of the greenhouses and grounds of the late Frederick L. Ames. Under his management the collection of rare Orchids in this place soon became well known, and at the time of his death, on the 16th of September, 1896, it had attained the distinction of being the most extensive and valuable collection of the kind in America.

From the first, Mr. Robinson manifested a lively interest in local horticultural matters. In the meetings and exhibitions of the Massachusetts Horticultural Society he found congenial surroundings. Ambitious, energetic, and impetuously enthusiastic, he quickly became influential among his brother gardeners, arousing life and activity in those with whom he came in contact, commanding from all that respect to which he was entitled as a leader and expert in his profession, and from many of us a deep and tender appreciation of his sterling manly qualities, his generous, sympathetic nature, and his fidelity to every trust reposed in him.

He became a member of this Society in October, 1883, but had already won many honors as a contributor to our exhibitions. The records of the Society show him to have won many Silver Medals and Certificates not only for Orchids, but for superior skill in the cultivation of difficult Stove Plants and Ferns. Many of the rarer Orchids, such as *Phalœnopsis grandiflora aurea* and *Cypripedium insigne Sanderæ*, were bloomed by him for the first time in America, the latter having won the highest possible award, the Gold Medal of the Massachusetts Horticultural Society. Many beautiful seedling Masdevallias, Cypripediums, and Cattleyas also attest his skill. For the last five years he had been a member of the Plant Committee.

We, therefore, do hereby record our recognition of his inestimable services in the cause of horticulture; of the honor and prestige which he was instrumental in bringing to this Horticultural Society; of his worth as a citizen and his manliness of character, gratefully yet sadly adding his name to the lengthening list of those who, having each in his allotted sphere endeavored to perform faithfully his whole duty, now rest from their earthly labors.

Respectfully submitted by the Committee,

FREDERICK L. HARRIS,
MICHAEL H. NORTON,
WILLIAM J. STEWART,
Committee.

This memorial also was unanimously adopted, and it was voted that it be entered on the records, and that a copy be sent to the family of Mr. Robinson.

The President, as Chairman of the Executive Committee, re-

ported a recommendation that the Society make the following appropriations for the year 1897, viz.:

For Prizes and Gratuities:	
For Plants	$2,000
" Flowers	2,600
" Fruits	1,800
" Vegetables	1,200
" Gardens	500
Total for Prizes and Gratuities for the year 1897	$8,100

These amounts are the same as those for the year 1896, except that for Vegetables, to which $50 is added.

The Executive Committee also recommended the following appropriations, all being the same as those for 1896:

For the Committee on Lectures and Publications, this sum to include the income of $50 from the John Lewis Russell Fund	$300
For the Committee of Arrangements, this sum to cover all extraordinary expenses of said Committee	400
For the Library Committee, for the purchase of Magazines and Newspapers, Binding of Books, and Incidental Expenses of said Committee	400
For the Committee on School Gardens and Children's Herbariums, this sum to cover all Incidental Expenses of said Committee and to be paid through the usual channels	250

This report was accepted, and, agreeably to the Constitution and By-Laws, was laid over for final action on the first Saturday in January next.

The Executive Committee also reported a recommendation that the Society request the Vegetable Committee to exercise strict care in the exhibitions of Fungi, with special reference to those labelled "Edible."

This recommendation was adopted.

William J. Stewart presented the following vote:

Voted, That the Vegetable Committee be requested to provide exhibition cards, distinctly colored (red or otherwise) and having

the word "Poisonous" plainly printed thereon, and that exhibitors of Fungi not known to be edible be required to use these cards in labelling all such exhibits when shown in Horticultural Hall.

This vote was passed in the affirmative.

The following named persons, having been recommended by the Executive Committee for membership in the Society, were upon ballot duly elected:

Hon. Charles F. Sprague, of Brookline,
George E. Stone, Professor of Botany in the Massachusetts Agricultural College, Amherst.

Adjourned to Saturday, December 5.

BUSINESS MEETING.

Saturday, December 5, 1896.

An adjourned meeting of the Society was holden at eleven o'clock, the President, Francis H. Appleton, in the chair.

The Annual Report of the Committee of Arrangements was read by Joseph H. Woodford, Chairman, accepted, and referred to the Committee on Publication.

John G. Barker, Chairman of the Committee on Gardens, made a partial report from that Committee, being the awards of Prizes and Gratuities for the year, for which, he stated, there had been more competition than in most years. This report was also accepted and ordered to be placed on file.

The Annual Report of the Library Committee was read by William E. Endicott, Chairman, accepted, and referred to the Committee on Publication.

William J. Stewart, Chairman of the Committee on Establishing Prizes, presented the Schedule of Prizes for 1897, and explained the most important changes in the Rules and Regulations, and also in the offer of Prizes. This report was accepted, with the provision that a vote of the Society concerning special prizes offered by individuals be complied with, and that it then be printed as the Schedule of Prizes for the year 1897.

J. Woodward Manning, Chairman of the Committee on Flowers, stated that the Annual Report of that Committee was ready, but

that he was unable to bring it with him, and would read it at the next meeting.

The Secretary announced the death of Samuel G. Damon, and it was voted that a committee of three be appointed by the Chair to prepare a memorial. The Chair appointed as that Committee Benjamin G. Smith, E. W. Wood, and Charles F. Curtis.

The President read the draft of a letter to the President-elect of the United States, concerning the appointment of the Secretary of Agriculture. It was unanimously voted that the letter be adopted as an expression of the views of the Society, and that the President be authorized to transmit it to the President-elect of the United States.

The following named persons, having been recommended by the Executive Committee for membership in the Society, were on ballot duly elected:

Hon. John Simpkins, of Yarmouthport,
B. Preston Clark, of Cohasset,
William V. Kellen, of Marion,
John G. Wright, of Brookline,
Miss Sarah L. Arnold, of Newton Centre,
James C. Scorgie, of Cambridge,
John W. Clark, of North Hadley.

Adjourned to Saturday, December 12.

BUSINESS MEETING.

Saturday, December 12, 1896.

An adjourned meeting of the Society was holden at eleven o'clock. The President and Vice-Presidents being absent, the meeting was called to order by the Secretary, and Patrick Norton was chosen Chairman *pro tem.*

The Annual Report of the Committee on Fruits was read by E. W. Wood, Chairman, accepted, and referred to the Committee on Publication.

The Annual Report of the Committee on Plants was presented by Azell C. Bowditch, Chairman, but as he was suffering from a

severe cold he was excused from reading it, and it was referred to the Committee on Publication.

J. Woodward Manning presented his report as Chairman of the Committee on Flowers.

John G. Barker presented his report as Chairman of the Committee on Gardens.

A portion of each of these reports was read, and they were then severally referred to the Committee on Publication.

Robert Manning read his Annual Report as Secretary and Librarian, which was accepted and referred to the Committee on Publication.

The following vote, moved by Joseph H. Woodford, was passed :

Voted, That the President instruct the Treasurer to pay all warrants issued or to be issued by the Chairmen of the various Committees to all persons serving on a Committee, irrespective of whether they are Chairmen of other Committees or not.

Henry L. Clapp, Chairman of the Committee on School Gardens and Children's Herbariums, read the Annual Report of that Committee, which was accepted and referred to the Committee on Publication.

The meeting was then dissolved.

REPORT

OF THE

COMMITTEE ON PLANTS,

FOR THE YEAR 1896.

By AZELL C. BOWDITCH, Chairman.

The exhibitions for the past year have shown a marked improvement, both in the number of exhibitors and also in the skill and care bestowed on the cultivation of the plants shown.

The capacity of our halls has been severely taxed at our larger shows, your Committee being obliged to crowd the large collections to an extent which greatly injured the effect of many of the collections and specimens exhibited; but as this matter is in competent hands we trust in the near future to find ourselves in more commodious quarters.

Your Committee take this opportunity to mention some of the most worthy exhibits during the season:

The first exhibition was held on the 11th of January, when William Thatcher and D. F. Roy showed some fine plants of an improved strain of Chinese Primrose.

On the 1st of February Robert Cameron (gardener at the Botanic Garden of Harvard University) exhibited a fine plant of *Angræcum sesquipedale* with twenty-five flowers, which was the admiration of everyone.

SPRING EXHIBITION.

March 24, 25, 26, and 27.

During this exhibition the weather was extremely cold, which deterred the orchid growers, whose displays have added so much to these occasions in the past, from bringing in their plants, and the

absence of Cinerarias was also noticeable. Yet, with all these drawbacks, the show was pronounced to be the finest yet given by the Society at this time of the year. First and best were the Cyclamens, of which there were nearly two hundred pots shown. Mrs. Benjamin P. Cheney (John Barr, gardener) had about seventy-five plants, on several of which were blooms measuring five inches from tip to tip; this lot was awarded the first prize. A close competitor was Nathaniel T. Kidder (William J. Martin, gardener), who was awarded the second prize. Undoubtedly a great attraction was Jackson Dawson's Crimson Rambler Rose; to describe the beauty of this plant, with its thousands of brilliant flowers, would be almost impossible; some of the trusses carried as many as forty flowers and buds. Your Committee deemed this a great acquisition, and awarded Mr. Dawson the Society Silver Medal.

MAY EXHIBITION.

May 2.

This brought a fine display of Calceolarias, Mrs. Benjamin P. Cheney staging twenty-six plants, all well flowered. Elisha S. Converse's plants showed quite a novel range of color; the individual blooms were of enormous size, and the foliage was very fine. Nathaniel T. Kidder had on exhibition a plant of *Bougainvillæa Sanderiana* fully six feet through, for which a Silver Medal was awarded. A fine specimen of *Boronia elatior*, fully six feet high, from the conservatories of Dr. C. G. Weld (Kenneth Finlayson, gardener), attracted a great deal of attention.

ROSE AND STRAWBERRY EXHIBITION.

June 23 and 24.

This brought a magnificent display of Orchids from the conservatories of E. V. R. Thayer (E. O. Orpet, gardener). Seldom do we see such well grown and well flowered Cattleyas and Odontoglossums. John L. Gardner (W. Thatcher, gardener) was represented by a fine group, and also W. P. Winsor (P. Murray, gardener), a new contributor. Nathaniel T. Kidder also exhibited a plant of *Schomburgkia tibicinis*, the gay-colored flowers of which attracted much attention.

August 15 we had from the Botanic Garden of Harvard University (Robert Cameron, gardener) a new greenhouse plant, *Angelonia angustifolia*, from seed gathered in New Mexico; the flowers are a light violet blue, and are borne in the axils of the leaves, the plants being small. Your Committee thought that another season and further development would enable them to judge better of its value. For the present they give it Honorable Mention.

ANNUAL EXHIBITION OF PLANTS AND FLOWERS.

September 2 and 3.

At this exhibition J. W. Manning made an exhibit of Hardy Coniferous Trees, among them being some new and rare varieties, which made quite an attractive display at the entrance to the halls; George A. Nickerson and Jason S. Bailey exhibited fine collections of greenhouse plants, which showed what good care and a thorough knowledge can do; their displays were, in the opinion of your Committee, among the best ever made.

September 19 J. W. Manning exhibited some plants of the new *Caryopteris Mastacanthus* (Blue Spiræa); it is perfectly hardy; flowers blue, borne in clusters at the axils of the leaves, making a hardy shrub which must be a great acquisition; it was awarded the Society's Silver Medal.

CHRYSANTHEMUM EXHIBITION.

November 10, 11, 12, and 13.

November 10 ushered in the Chrysanthemum Exhibition, which was without doubt the finest ever staged in America; the average high quality of the exhibit was remarkable. The three principal exhibitors for the twelves were: Nathaniel T. Kidder (William J. Martin, gardener), Walter Hunnewell (T. D. Hatfield, gardener), and Mrs. Benjamin P. Cheney (John Barr, gardener). They took prizes in the order named. Mr. Kidder's excelled in general effect; his plants were very even, and the foliage was excellent. Mr. Hunnewell's were not so regular; but two of them, W. H. Lincoln and Garza, were certainly the two finest specimens that ever entered the hall. Mrs. Cheney's plants were perfect

models, regular and dwarf, but suffered in general effect. The groups in the centre of the hall, arranged for general effect with palms and foliage plants, gave the competitors a chance to show their taste and skill in the arrangement, and quite put your Committee on their mettle before they could come to a decision.

Amount appropriated for 1896		$2,000 00
Amount awarded in Prizes and Gratuities	$1,921 00	
Balance unexpended	79 00	
		2,000 00

All of which is respectfully submitted.

A. C. Bowditch,
James Comley,
James Wheeler,
} *Committee.*

PRIZES AND GRATUITIES AWARDED FOR PLANTS.

1896.

January 11.

Chinese Primroses. — Six plants, in six-inch pots, John L. Gardner, $5 00
Second, Elisha S. Converse 4 00
Third, John L. Gardner 3 00

Gratuity : —
Walter Hunnewell (T. D. Hatfield, gardener), Lachenalias . . 2 00

February 1.

Freesias. — Six pots, the second prize to the Bussey Institution . 4 00

Gratuities : —
David Nevins, Twelve Violets in ten-inch pots 5 00
Botanic Garden of Harvard University, Collection of Freesias and Strobilanthes 4 00
Walter E. Coburn, Twelve Chinese Primroses 2 00
Richard T. Lombard, Violets 1 00

February 8.

Gratuities : —
James Comley, Epacris 1 00
Botanic Garden of Harvard University, *Platyclinis glumacea* . . 1 00

February 15.

Gratuity : —
Walter Hunnewell, Impatiens, Begonias, and Coleus . . . 2 00

February 29.

Gratuity : —
James Comley, Cypripedium 3 00

SPRING EXHIBITION.

March 24, 25, 26, and 27.

Theodore Lyman Fund.

Indian Azaleas. — Six distinct named varieties in pots, Bussey Institution 30 00
Second, James Comley 20 00

Society's Prizes.

Indian Azaleas. — Four distinct varieties in not exceeding ten-inch pots, Bussey Institution 12 00
Second, Bussey Institution 10 00

Two distinct named varieties, Dr. C. G. Weld	6 00
Second, Bussey Institution	4 00
Specimen plant, named, Norton Brothers	8 00
Second, Bussey Institution	6 00
Single plant of any named variety, in not exceeding an eight-inch pot, Dr. C. G. Weld	5 00
Second, Bussey Institution	4 00
ERICAS. — Six, not less than three species, Bussey Institution	6 00
HARDY ORCHIDS. — Collection in pans or pots, forced, Bussey Institution	2 00
Second, Bussey Institution	1 00
STOVE OR GREENHOUSE PLANTS. — Specimen in bloom, other than Azalea or Orchid, Dr. C. G. Weld	8 00
Second, Elisha S. Converse	6 00
HARD-WOODED GREENHOUSE PLANTS. — Four in bloom, Dr. C. G. Weld	10 00
HYBRID PERPETUAL ROSES. — Forced, six plants in pots, not less than three distinct varieties, James Comley	5 00
Second, James Comley	4 00
FORCED HARDY HERBACEOUS PLANTS AND SHRUBS. — The second prize to the Bussey Institution	15 00
HARDY FLOWERING DECIDUOUS SHRUBS, FORCED. — Four, of four distinct species, Bussey Institution	8 00
Second, Bussey Institution	6 00
Third, Bussey Institution	4 00
HARDY FLOWERING EVERGREEN SHRUBS, FORCED. — Four, of four distinct species, Bussey Institution	8 00
HARDY PRIMROSES AND POLYANTHUSES. — Twelve plants of distinct varieties, John L. Gardner	8 00
Second, Dr. C. G. Weld	6 00
Third, David Nevins	4 00
AURICULAS. — Six, in pots, Dr. C. G. Weld	3 00
CYCLAMENS. — Ten plants in bloom, Mrs. Benjamin P. Cheney	15 00
Second, Nathaniel T. Kidder	12 00
Third, Mrs. B. P. Cheney	10 00
Fourth, Mrs. B. P. Cheney	8 00
Ten plants in bloom, in not over seven-inch pots, Mrs. Benjamin P. Cheney	8 00
Second, Mrs. Benjamin P. Cheney	6 00
Third, Nathaniel T. Kidder	4 00
Single plant in bloom, Nathaniel T. Kidder	5 00
Second, David Nevins	4 00
CINERARIAS. — Six varieties, John L. Gardner	10 00
Second, Mrs. Benjamin P. Cheney	8 00
Third, Jason S. Bailey	6 00
Fourth, Bussey Institution	4 00

Three varieties, Mrs. Benjamin P. Cheney 6 00
Second, John L. Gardner 5 00
Third, Elisha S. Converse 4 00
Single plant, John L. Gardner 4 00
Second, Mrs. Benjamin P. Cheney 3 00
Third, Elisha S. Converse 2 00

Spring Flowering Bulbs.

Hyacinths. — Twelve distinct named varieties, in pots, one in each pot, John L. Gardner 8 00
Second, Bussey Institution 6 00
Third, Dr. C. G. Weld 4 00
Six distinct named varieties, in pots, one in each pot, Dr. C. G. Weld 5 00
Second, Elisha S. Converse 4 00
Third, Bussey Institution 3 00
Three distinct named varieties, in pots, one in each pot, Dr. C. G. Weld 3 00
Second, Elisha S. Converse 2 00
Third, Bussey Institution 1 00
Single named bulb, in pot, Miss Mary S. Walker 2 00
Second, Dr. C. G. Weld 1 00
Three pans, not to exceed twelve inches, twelve bulbs of one variety in each pan, Miss M. S. Walker 8 00
Second, Dr. C. G. Weld 6 00
Third, John L. Gardner 4 00
Two pans, not to exceed twelve inches, ten bulbs of one variety in each pan, Elisha S. Converse 6 00
Second, Bussey Institution 4 00
Third, Miss M. S. Walker 3 00
Single pan, not to exceed ten inches, ten bulbs of one variety, Bussey Institution 4 00
Second, Miss M. S. Walker 3 00
Third, Elisha S. Converse 2 00
Tulips. — Six eight-inch pans, nine bulbs of one variety in each, Warren Ewell & Son 4 00
Three eight-inch pans, nine bulbs of one variety in each, Warren Ewell & Son 3 00
Three ten-inch pans, twelve bulbs of one variety in each, Miss M. S. Walker 5 00
Second, Warren Ewell & Son 4 00
Polyanthus Narcissus. — Four seven-inch pots, three bulbs in each, distinct varieties, Dr. C. G. Weld 6 00
Jonquils. — Six six-inch pots or pans, the number of bulbs in each to be at the discretion of the grower, Bussey Institution . 4 00
Second, Dr. C. G. Weld 3 00
Third, Warren Ewell & Son 2 00

NARCISSUSES. — Six eight-inch pans, distinct varieties, single or double, Warren Ewell & Son 5 00
Second, Bussey Institution 4 00
Three eight-inch pans, Warren Ewell & Son 4 00
Second, Bussey Institution 3 00
LILIUM HARRISII. — Six pots, not exceeding ten inches, Elisha S. Converse 8 00
Second, Mrs. Benjamin P. Cheney 6 00
LILY OF THE VALLEY. — Six six-inch pots, Bussey Institution . 4 00
Second, Warren Ewell & Son 3 00
Third, Warren Ewell & Son 2 00
ANEMONES. — Three pots or pans, Bussey Institution . . . 4 00
FREESIAS. — Six pots or pans, Bussey Institution 4 00
Second, Dr. C. G. Weld 3 00
Third, John L. Gardner 2 00
IXIAS AND TRITONIAS. — Six pots or pans, in varieties, Dr. C. G. Weld 4 00
Second, Dr. C. G. Weld 3 00
ROMAN HYACINTHS. — Six eight-inch pans, ten bulbs in each, Warren Ewell & Son 4 00
GENERAL DISPLAY OF SPRING BULBS. — All classes, Bussey Institution 15 00
Warren Ewell & Son 12 00

Gratuities: —

H. H. Rogers, Cyclamen and Cinerarias 7 00
Dr. C. G. Weld, *Acacia pubescens* 6 00
Edward Butler, Dendrobium 5 00
Mrs. Benjamin P. Cheney, Display of Cyclamens 5 00
James Comley, Forced Roses 5 00
David Nevins, Display of Violets 4 00
Dr. C. G. Weld, Display 5 00
James Comley, Display 5 00

APRIL 11.

Gratuities: —

James Comley, Display of Azaleas 5 00
Edward Butler, " " Orchids 4 00

APRIL 18.

Gratuity: —

Fred W. Fletcher, *Justicia carnea* 1 00

APRIL 25.

Gratuity: —

James Comley, Seedling Azalea 2 00

MAY EXHIBITION.

May 2.

Pelargoniums. — Six named Show or Fancy varieties, in not less than eight-inch pots, in bloom, Nathaniel T. Kidder	6 00
Indian Azaleas. — Six plants, in pots, named, Dr. C. G. Weld	15 00
Second, Dr. C. G. Weld	12 00
Single specimen, Dr. C. G. Weld	5 00
Second, James Comley	4 00
Calceolarias. — Six varieties, in pots, Mrs. Benjamin P. Cheney	8 00
Second, Elisha S. Converse	7 00
Third, Mrs. Benjamin P. Cheney	5 00
Fourth, Mrs. Benjamin P. Cheney	4 00
Single plant, Mrs. Benjamin P. Cheney	3 00
Second, Mrs. Benjamin P. Cheney	2 00
Streptocarpus. — Six pots, Dr. C. G. Weld	3 00
Second, Dr. C. G. Weld	2 00
Gratuities: —	
Dr. C. G. Weld, Display of *Boronia elatior*	5 00
Dr. C. G. Weld, Display	3 00

June 4.

Gratuities: —	
John L. Gardner, Collection of Orchids	10 00
Oakes Ames, *Dendrobium thyrsiflorum*	2 00

ROSE AND STRAWBERRY SHOW.

June 23 and 24.

Hard-wooded Greenhouse Plants. — Three, of three distinct named varieties, in bloom, John L. Gardner	8 00
Orchids. — Six plants, of six named varieties, in bloom, E. V. R. Thayer	25 00
Second, John L. Gardner	15 00
Three plants, of three named varieties, in bloom, John L. Gardner	15 00
Second, E. V. R. Thayer	10 00
Single specimen, named, E. V. R. Thayer	8 00
Second, John L. Gardner	6 00
Tuberous Begonias. — Six pots, of six varieties, Dr. C. G. Weld,	6 00
Gratuities: —	
W. P. Winsor, Collection of Orchids	10 00
Norton Brothers, Palms	2 00

JULY 18.

ACHIMENES. — Six, in not over eight-inch pans or pots, of six varieties, Dr. C. G. Weld 5 00

AUGUST 1.

Gratuity : —

Bussey Institution, Display of Hydrangeas 8 00

AUGUST 8.

Gratuities : —

James E. Rothwell, Display of Orchids 4 00

Mrs. P. D. Richards, Plants 2 00

ANNUAL EXHIBITION.

SEPTEMBER 2 AND 3.

HARDY CONIFEROUS TREES. — Not Natives of New England, Display in pots and tubs, named, J. W. Manning 25 00

PALMS. — Pair, in pots or tubs not more than twenty-four inches in diameter, Dr. C. G. Weld 12 00

Second, J. W. Howard 8 00

Pair, in pots not more than fourteen inches in diameter, John L. Gardner 8 00

Second, J. W. Howard 6 00

GREENHOUSE PLANTS. — Collection, containing Foliage Plants of all descriptions, not to exceed forty plants, in pots or tubs, George A. Nickerson 40 00

Second, Jason S. Bailey 30 00

Six Greenhouse or Stove Plants, of different named varieties, two Crotons admissible, Nathaniel T. Kidder 25 00

Second, John L. Gardner 20 00

Third, Dr. C. G. Weld 15 00

Single plant for table decoration, in a twelve-inch pan or basket, dressed at the base with living plants only, only one entry admissible, George A. Nickerson 8 00

Second, Elisha S. Converse 6 00

Third, John Jeffries 4 00

SPECIMEN FLOWERING PLANT. — Single named variety, Joseph H. White 8 00

Second, Joseph H. White 6 00

FUCHSIAS. — Six, in not over ten-inch pots, Joseph H. White . . 12 00

Second, Nathaniel T. Kidder 10 00

ORNAMENTAL LEAVED PLANTS. — Six named varieties, Crotons and Dracænas not admissible, Dr. C. G. Weld 15 00

Second, Joseph H. White 12 00

Third, John L. Gardner 10 00

Single specimen, variegated, named, not offered in any collection, George A. Nickerson 5 00
Second, Nathaniel T. Kidder 4 00
Third, Joseph H. White 3 00
Caladiums. — Six named varieties, Dr. C. G. Weld . . . 6 00
Second, Nathaniel T. Kidder 4 00
Ferns. — Six named varieties, no Adiantums admissible, Joseph H. White 10 00
Second, Dr. C. G. Weld 8 00
Specimen, other than Tree Fern, Elisha S. Converse . . . 4 00
Second, George A. Nickerson 3 00
Tree Fern. — Single specimen, named, not less than six feet in height, George A. Nickerson 10 00
Second, John L. Gardner 8 00
Adiantums. — Five named varieties, George A. Nickerson . . 8 00
Second, Joseph H. White 5 00
Lycopods. — Four named varieties, Nathaniel T. Kidder . . 5 00
Second, Dr. C. G. Weld 4 00
Dracænas. — Six named varieties, George A. Nickerson . . . 8 00
Second, Dr. C. G. Weld 6 00
Crotons. — Six, named, in not less than eight-inch pots, Dr. C. G. Weld 10 00
Second, Dr. C. G. Weld 8 00
Cycad. — Single plant, named, J. W. Howard 10 00
Second, Elisha S. Converse 8 00
Orchids. — Three plants, named varieties, in bloom, the second prize to James E. Rothwell 8 00
Begonia Rex. — Six pots, of six varieties, James L. Little . . 6 00
Second, James L. Little 4 00
Tuberous Begonias. — Six pots, of six varieties, James L. Little . 6 00
Second, James L. Little 4 00
Ouvirandra Fenestralis. — E. S. Converse 8 00

Gratuities : —

John Jeffries, Collection of Ferns 8 00
J. W. Howard, Collection of Palms 5 00
Jason S. Bailey, *Dipladenia amabilis* 5 00
Botanic Garden of Harvard University, Display 50 00
Joseph H. White, Display 10 00
John L. Gardner, " 5 00
J. W. Howard, " 3 00

October 1.

Gratuity : —

Jason S. Bailey, Collection of Orchids 4 00

October 31.

Gratuity : —

Oakes Ames, *Stanhopea oculata.* 2 00

CHRYSANTHEMUM SHOW.

November 10, 11, 12, and 13.

Chrysanthemums. — Display of twelve named plants, any or all classes, distinct varieties, Nathaniel T. Kidder . . . 50 00
Second, Walter Hunnewell 40 00
Third, Mrs. Benjamin P. Cheney 30 00
Twelve plants of twelve different varieties, grown to one stem and bloom, in not over six-inch pots, preference being given to plants not more than three feet in height, Samuel J. Trepess, 10 00
Second, James L. Little 8 00
Third, Dr. C. G. Weld 6 00
Fourth, J. W. Howard 4 00
Red, six plants, grown as above, but all of one color and of different varieties, James L. Little 5 00
Second. Dr. C. G. Weld 4 00
Third, Donald McRea 3 00
White, Dr. C. G. Weld 5 00
Second, James L. Little 4 00
Third, Elisha S. Converse 3 00
Pink, James L. Little 5 00
Second, Dr. C. G. Weld 4 00
Third, Elisha S. Converse 3 00
Yellow, James L. Little 5 00
Second, Dr. C. G. Weld 4 00
Third, Donald McRea 3 00
Six Reflexed, distinct named varieties, Mrs. Benjamin Cheney . 20 00
Specimen Incurved, named variety, Nathaniel T. Kidder . . 6 00
Second, Nathaniel Kidder 5 00
Specimen Reflexed, named variety, Walter Hunnewell . . . 6 00
Second, C. W. Hubbard 5 00
Third, Mrs. Benjamin P. Cheney 4 00
Specimen Pompon, named variety, Mrs. Benjamin P. Cheney . 4 00
Group of plants arranged for effect, limited to one hundred and fifty square feet, preference being given to collections with palms or other foliage added, A. W. Blake 45 00
Second, Dr. C. G. Weld 40 00
Third, J. W. Howard 35 00
Fourth, Elisha S. Converse 30 00
Fifth, James Comley 25 00

Gratuities : —

Mrs. B. P. Cheney, Display of *Adiantum Farleyense* . . . 15 00
Walter Hunnewell, Display of Chrysanthemums 8 00

SOCIETY'S SILVER MEDALS.

February 1. Botanic Garden of Harvard University, *Angræcum sesquipedale.*
March 7. W. P. Winsor, *Cattleya Trianæ*, var. *alba.*
Spring Exhibition, March 24–27. Jackson Dawson, Crimson Rambler Rose.
" " " " Dr. C. G. Weld, *Acacia Drummondii.*
April 4. Nathaniel T. Kidder, *Cattleya intermedia.*
May Exhibition, May 2. Nathaniel T. Kidder, *Bougainvillæa glabra* var. *Sanderiana.*
May 23. John L. Gardner, Display of Orchids.
June 4. James Comley, New White Hydrangea.
Annual Exhibition, September 2 and 3. Jason S. Bailey, *Maranta roseo-lineata.*
" " " " George Marston Whitin, *Caladium argyrites*, *C. minus* var. *erubescens*, and *Dipladenia splendens*, var. *profusa.*
September 18. J. W. Manning, *Caryopteris Mastacanthus.*
November 28. J. E. Rothwell, *Cypripedium insigne* var. *Ernestii.*

APPLETON SILVER MEDAL.

July 11. Nathaniel T. Kidder, *Adamia versicolor.*

FIRST CLASS CERTIFICATES OF MERIT.

Spring Exhibition, March 24–27. J. F. Hess, *Streptocarpus Wendlandii.*
April 25. R. & J. Farquhar, Spiræa Anthony Waterer.
June 4. Oakes Ames, *Cypripedium Sargentianum.*
Annual Exhibition, September 2 and 3. J. W. Howard, *Asparagus Sprengeli.*
October 1. Oakes Ames, Collection of Cypripediums.

HONORABLE MENTION.

Spring Exhibition, March 24–27. J. F. Hess, *Adiantum Æthiopicum.*
Rose and Strawberry Show, June 23 and 24. W. A. Manda, South Orange, N. J., *Rosa Wichuraiana.*
" " " " " " Nathaniel T. Kidder, *Schomburgkia tibicinis.*
August 15. Botanic Garden of Harvard University, *Angelonia angustifolia.*
Chrysanthemum Show, November 10–13. Dr. C. G. Weld, *Browallia speciosa* var. *major.*

COMPLIMENTARY NOTICES.

April 25. R. & J. Farquhar, *Silene pendula* var. *Amalia.*
May 23. Ernest G. Buttrick, *Cypripedium arietinum.*
Rose and Strawberry Show, June 23 and 24. E. V. R. Thayer, *Odontoglossum crispum* var.

REPORT

OF THE

COMMITTEE ON FLOWERS,

FOR THE YEAR 1896.

By J. WOODWARD MANNING, Chairman.

The past season has been remarkable in many respects: unusual weather conditions have prevailed, and as a consequence the exhibits were affected to a greater or less extent. The result was the retarding of many flowers in the early part of the summer; while in late summer and early autumn continued rains very seriously interfered with their perfection. On the whole, however, the exhibits have been exceedingly satisfactory throughout the year, and I believe that there has been a larger number of exhibitors than heretofore. This has been particularly noticeable from having drawn very severely upon the appropriation allowed the Committee for awarding gratuities in accordance with the respective merits of the exhibits. Several of the exhibitors have made interesting displays at most of the Saturday and regular exhibitions. These displays have not only been exceedingly creditable to the exhibitors, but have greatly improved the general effect of the hall. The Committee are, however, of the opinion that there has been more negligence in the matter of naming exhibits that are shown for gratuities alone than has been the case in the past, and they have made recommendations to the Committee for Establishing Prizes which it is hoped will obviate this difficulty in the future.

Exhibitions for gratuities commenced on the 4th of January,

with a choice collection of Chinese Primroses from Walter E. Coburn, Freesias from Mrs. E. M. Gill, and Camellias and Orchids from James Comley and E. Sheppard & Son.

January 11 a very creditable display was made by several parties, and choice Carnations were exhibited. David Nevins made a very interesting display of Violets, through his gardener, Alexander McKay, and Camellias were shown in specimen blooms by James Comley.

The following Saturday W. E. Coburn displayed an unusually large and fine collection of single cut blooms of Chinese Primroses, arranged in the Society's flat dishes. These were shown with a view of emphasizing their great improvement of late years in the range of color, size of bloom, and breadth and fimbriation of petals.

At the regular exhibition, February 1, David Nevins exhibited Violets which excited unusual comment. Carnations were very fully shown, of which William C. Ward, of Queens, N. Y., exhibited two large vases of Meteor and Bridesmaid, both of which were deemed worthy of Honorable Mention by your Committee. Camellias were staged in great variety of size and color, and the display of other cut flowers was large.

At each Saturday following, until the Spring Exhibition, liberal displays were made, the principal exhibitors being Oakes Ames, James Comley, and Mrs. E. M. Gill. March 14, David Nevins showed some remarkably fine forced Hybrid Perpetual Roses, and H. H. Hunnewell some new seedling Amaryllises, which excited much admiration.

SPRING EXHIBITION.

March 24, 25, 26, and 27.

At this exhibition most of the prizes were closely competed for, the display of Roses being particularly noteworthy and drawing forth much praise from an appreciative public. A vase of American Beauty Roses from Charles V. Whitten was the centre of attraction in the hall; they were remarkable for size of flower, length of stem, excellence of foliage, and keeping quality. William H. Elliott displayed several magnificent vases of Roses, which, in the general opinion of your Committee, had

never been excelled by any exhibitor at the hall. There were no exhibitors of the Belle Siebrecht and Perle des Jardins Roses. The Carnation prizes were very freely competed for, William Nicholson being the principal exhibitor and carrying off several of the first prizes. The usual difficulty of maintaining Carnations in perfect condition for several days was encountered at this time, and as a result it was necessary for the Committee to make some changes in the final awards, where parties were negligent in the matter of renewing their exhibitions. Pansies were shown in great variety by Hon. Joseph S. Fay, and the Violet prizes were competed for by David Nevins, William C. Winter, and Harry S. Rand. Camellias were shown by Joseph H. White and James Comley. The increased number of exhibitions of Camellias was evidence of the renewed interest in this valuable class of late winter blooming plants; with a closer regard to the improvement of the fimbriated varieties it would seem that the class would regain something of its previous foothold in public estimation. James Comley displayed two pans of *Rhododendron Veitchianum*, with flowers of immaculate whiteness — large, fragrant, and of good keeping quality. This valuable winter blooming Rhododendron has been shown for several seasons past by the same exhibitor, and its great apparent value would seem to recommend it to others for cultivation. Displays of flowers were made at this time by Mrs. E. M. Gill, James Comley, and Oakes Ames.

April 4, James Comley exhibited forced Chinese Wistarias and made a large display of cut Roses. David Nevins staged Roses and Orchids.

April 11, Mrs. P. D. Richards made the first display of native plants; at this date the usual exhibits of cut flowers were made by other exhibitors.

MAY EXHIBITION.

May 2.

Tulips were not competed for at this exhibition. This, we believe, has been the case for one or two seasons back. It seems a pity that large exhibitions are not made of this valuable class of bulbs, as they could be shown to great advantage and would lend additional interest and variety to the show. Hardy Narcissuses were shown very creditably by Dr. C. G. Weld and the Bussey

Institution. Hon. Joseph S. Fay carried off all three prizes for Pansies by a most remarkable display comprising a marvellous range and combination of coloring and great size of individual blooms. Native plants were shown in great variety by Mrs. P. D. Richards, Miss Genevieve Doran, Misses Eleanor and Mollie Doran, and Oakes Ames. There was no competition with Herbaceous Plants for either of the scheduled prizes, but the Botanic Garden of Harvard University took up a large portion of one side of the hall with an extremely interesting exhibit. Messrs R. and J. Farquhar & Company made a small exhibit of flowers of the new Canna Italia, for which a Complimentary Notice was awarded by the Committee.

RHODODENDRON SHOW.

June 4 and 5.

At this show the competition for prizes was very close, the principal exhibitors being James Comley, John L. Gardner, and Samuel Trepess. There were not as many competitors as usual, mainly owing to the fact that the plants had received serious injury from the past very severe winter. The exhibits that were made were very creditable, and the general displays made by James Comley and H. H. Hunnewell occupied a large portion of the hall and attracted great attention. Azaleas were shown in great variety, and Herbaceous Pæonies were displayed by John L. Gardner and George Hollis. Clematises and Hardy Flowering Trees and Shrubs were not shown as well as usual. Herbaceous Plants were competed for, for the first time at this exhibition. Native Plants were present in large variety, and attracted much attention from the public.

The exhibition on June 13 proved to be one of the most noteworthy of the season; Herbaceous Pæonies, Oriental Poppies, and Aquilegias were the principal flowers exhibited. Herbaceous Pæonies were shown in great variety by Thomas C. Thurlow and others, and a marked improvement in the cultivation of the flowers exhibited was noticed. This proves the great interest that is being taken in Pæonies in general; the flowers showed a wonderful range of coloring, size, and perfection of bloom, and many varieties were noteworthy for their fragrance. The increased size of the exhibits has made it advisable in the opinion of the

Committee that a regular Pæony Exhibition be scheduled, with an increase in the amount of the prizes, as it would seem that Pæonies should have a merited recognition with Rhododendrons and Roses. Jackson Dawson exhibited a collection of new seedling Roses, hybrids of *Rosa multiflora*, all of which were particularly interesting; they comprised a variety of color and size of bloom, in very small double flowers arranged in dense panicles, and your Committee awarded the Society's Silver Medal for the display. Another Society's Silver Medal was awarded the same skilful cultivator for a new Hybrid Rose, a cross between *Rosa Wichuraiana* and General Jacqueminot; and Honorable Mention was given him for a new seedling Double White Rose originating from the Boston Belle.

ROSE AND STRAWBERRY EXHIBITION.

June 23 and 24.

The prizes for Roses called forth a close competition by a large number of exhibitors, and the quality of the individual blooms has never been surpassed. Hon. Joseph S. Fay was the largest exhibitor, and carried off many first prizes; the quality and variety of his flowers was an ample testimonial to the extent of his collection and the skill of his gardener, M. H. Walsh. Most of the prizes scheduled were competed for, and altogether the exhibition proved very satisfactory. Polyantha Roses, however, did not receive the attention which we hoped would be given them. At this exhibition, John Jeffries made a display of Japanese Pæonies which was particularly unique, and received the Society's Silver Medal. The display consisted of very finely formed single flowered varieties, and others with broad overlapping guard petals and a ball of numerous narrow, twisted, golden and variegated petals in the centre. At this display, also, a First Class Certificate was awarded to Hon. Joseph S. Fay for his new Rose, Lillian Nordica.

On the following Saturday, a very large exhibit of Roses was made, occupying a considerable portion of the lower hall. *Iris Kæmpferi*, *Lilium candidum*, and Hardy Carnations were very little shown at this date. In the case of *Iris Kæmpferi* it was due to the flowers not being in perfection at that time. The Botanic

Garden of Harvard University made a very large display of Hardy Herbaceous Perennials, occupying the entire right-hand side of the lower hall, and M. H. Walsh, gardener to Hon. Joseph S. Fay, displayed a new seedling Rose named "Joseph S. Fay," for which the Society awarded Honorable Mention.

Hollyhocks were so seriously injured by the past winter that no display was made on the regular prize day (July 11); indeed this flower seemed to have suffered more severely than for many previous seasons.

Native Plants continued to be a feature throughout the balance of the season, and the competition being close it was difficult for your Committee to decide awards, and we would repeat the suggestion made by the Chairman of the Flower Committee of last year, which is: That we believe it to be unjust in some respects to both Committee and Exhibitors, to ask the regular Flower Committee to judge botanical collections of Native Plants, as it would be far better in our estimation for a competent botanist or Committee of botanists to judge upon these exhibits. We are very glad to note that a skilled botanist has been added to our Committee this season, as this will largely obviate the difficulty mentioned.

July 18, Gloxinias and Tuberous Begonias were shown in variety, and the prize for Hardy Ferns was closely competed for, drawing out some very noteworthy exhibitions. On this day Hon. Joseph S. Fay made a very large display of Hollyhocks, Phloxes, Roses, and Delphiniums, and Hon. John Simpkins (James Brydon, gardener) made a remarkable exhibition of Aquatic Plants which excited great admiration. Arthur E. French exhibited at the same time a collection of Grasses and Sedges which was very interesting.

July 25, Sweet Peas were shown in great perfection, and the Botanic Garden of Harvard University made a display of Herbaceous Plants, probably the largest ever seen in the hall, for which your Committee awarded the Society's Silver Medal.

August 8 brought forth the largest display of Annuals that has been seen in the hall for many years. The Society's prizes were generously competed for, and in addition to this the Botanic Garden of Harvard University made a special display of Annuals which occupied an entire side of the hall, comprising the most remarkable variety and arranged in a most effective manner, and

for which a Society's Silver Medal was awarded. At this date Dahlias were first shown, and continued to be an interesting feature of the display until the end of their season. The new Double Rudbeckia (*R. laciniata* var. Golden Glow), a very choice new Hardy Herbaceous Perennial, growing six to seven feet high, forming a broad, sturdy bush with a great profusion of very double bright yellow flowers on long clean stems, was shown simultaneously by Rea Brothers and Jacob W. Manning, to both of whom First Class Certificates were awarded therefor. Henry A. Dreer, of Philadelphia, staged a new variety of Nelumbium, named Shiroman, of the purest white, for which a First Class Certificate was awarded; also the new Nymphæa, O'Marana, of which Honorable Mention was made. The display of Gladioli did not come up to the standard of past seasons, probably owing to conditions of the weather.

The prizes for Annual Asters were competed for on the twenty-second of August in several classes, but owing to the weather and insect depredations the display was not as large as in past seasons. L. W. Goodell made a display of Drummond Phlox which was remarkable for the variety of colors shown and the range in size and form of the flowers; also a very creditable display of Salpiglossis. A tank of foliage and flowers of the *Nelumbium luteum* was shown by J. Woodward Manning from a native locality; these attracted much attention.

ANNUAL EXHIBITION OF PLANTS AND FLOWERS.

September 2 and 3.

The exhibition was particularly noteworthy for its display of Aquatics, of which John Simpkins and Oakes Ames were the principal exhibitors. Dahlias also were a prominent feature of the exhibition, and excited much rivalry among the exhibitors. Cannas were freely shown, but it was justly remarked that these are better exhibited as plants than displayed as cut flowers, from the fugaciousness of their petalage. Oakes Ames (Carl Blomberg, gardener) exhibited a new Nymphæa, a cross between *Nymphæa Zanzibarensis* and its variety *rosea*, named Mrs. Anna C. Ames, the flowers of which were amaranth crimson with the base of the petals shaded to pure white, for which your Committee awarded a First Class Certificate of Merit. To Miss Eliza Wellington, of East Lexington, a First Class Certificate of Merit was awarded

for superior cultivation and exhibition of *Clianthus Dampieri*, and to J. F. Huss a First Class Certificate of Merit was awarded for *Pennisetum Ruppellii*, a new annual grass resembling a miniature Eulalia, but with long, close feathery blooms, of a showy purplish tinge, being closely allied to Squirrel Grass. Honorable Mention was also granted James Comley for a new Perennial Pea, a cross between *Lathyrus latifolius* and *L. odoratus*.

October 16, Hon. John Simpkins made a display of early Chrysanthemums, and a special vase of the Chrysanthemum Mrs. Henry Robinson, for which a First Class Certificate of Merit was awarded. This white variety seems remarkable for its large flowers, purity of color, and earliness.

CHRYSANTHEMUM SHOW.

November 10, 11, 12, and 13.

The Chrysanthemum Show was a success in every sense of the word. The marvellous size and perfection of the flowers shown gave sure proof of the excellence of their culture. Competition was close, rendering the matter of judgment on the part of the Committee difficult. The principal exhibitors were Hon. John Simpkins, Joseph H. White, Charles Souther, Mrs. Benjamin P. Cheney, W. Slack, J. W. Howard, and the Waban Conservatories. In cut single blooms, Mr. Simpkins's display was marvellous, one flower being noted with a circumference of twenty-five inches. The vases of ten blooms each were shown to the greatest advantage by the Waban Conservatories. The display for effect, in the Society's large vases, was particularly interesting, and the prizes were very closely competed for. There seems to be no lack of interest shown in the culture of the Chrysanthemum, and it was the general opinion of the Committee that competition was as close as in any previous year. In the new seedlings, J. Eaton, jr., carried off the prize for the best pink variety with Quissett, and for a white variety with Nonquit. Joseph H. White received the first prize for the new silvery pink incurved variety, Li Hung Chang, and Charles Souther exhibited a very creditable new bronze colored seedling without name. A display of Violets was made by François Supiot, of Germantown, Penn., which attracted much attention, and First Class Certificates of Merit were awarded for each of the varieties

Luxonne, a very large, single, intensely fragrant, rich blue flower, and Princess des Galles, a single flower of a deeper shade of blue.

The display of Aquatics throughout the season has been unusually good, the principal exhibitor outside of the regular exhibitions being Oakes Ames (Carl Blomberg, gardener). The importance of this class of plants is manifest, and it seems advisable that a special day should be set apart for a general display of them.

The difficulty of combining a display of plants and flowers of Chrysanthemums on the same day to cover all classes, including early and late varieties, has been very apparent, more especially affecting as it does the early blooming sorts. For that reason it seems advisable that special prizes be offered for the early blooming sorts at an earlier date than the regular Chrysanthemum Show. The increased interest that has been taken by cultivators of the early blooming sorts, and the marvellous number of named varieties of such, has made it seem necessary that some action be taken in recognition of this class.

The increase in the number of displays and new varieties of plants has been such as seriously to cut into the appropriation in many instances during the year. For this reason it is deemed advisable by the Committee to insist more particularly in the future on the correct naming of each variety of flower exhibited for gratuities. This seems necessary both for the good of the Society and the enlightenment of the public, and also to enable the Committee to keep within the appropriation allowed by the Society.

The display of Herbaceous Plants for the year has been disappointing from the lack of competition. It seems that the effort of the Committee on Establishing Prizes to gain more exhibitors by decreasing the required number of vases and increasing the awards has not had the desired effect. The Flower Committee regret that this condition exists, and hope that another year may bring closer competition in this valuable class of plants. The displays of Native Plants have been ample, and at times have taxed the capacity of the space allowed them. The competition has been close, and the exhibitions have attracted much attention from the public.

The amount appropriated for the year 1896 was . .	$2,600 00
We have awarded in prizes and gratuities, including medals	2,638 00
Making a deficit of	$38 00

All of which is respectfully submitted,

J. Woodward Manning,
Michael H. Norton,
Thomas C. Thurlow,
Kenneth Finlayson,
Frederick S. Davis,
} *Committee.*

PRIZES AND GRATUITIES AWARDED FOR FLOWERS.

1896.

January 4.

Gratuities : —

James Comley, Camellias, Orchids, etc.	$4 00
W. E. Coburn, Chinese Primroses	1 00
Mrs. E. M. Gill, Freesias	1 00
E. Sheppard & Son, Dendrobiums	1 00

January 11.

Gratuities : —

David Nevins, Display of Violets	2 00
W. N. Craig, Vase of Freesia refracta	1 00
W. N. Craig, Vase of Mixed Carnations	1 00
Peter Fisher, Vase of Carnation Edith Foster	1 00
William Nicholson, Vase of Carnation White Queen	1 00
James Comley, Display of Camellias	1 00
Mrs. E. M. Gill, Display of Flowers	1 00

January 18.

Gratuities : —

Walter E. Coburn, Primroses	2 00
E. Sheppard & Son, Cinerarias and Dendrobiums	1 00

January 25.

Gratuities : —

James Comley, Display of Flowers	5 00
Oakes Ames, " " "	5 00

February 1.

Violets. — Best collection of varieties, fifty blooms of each in a bunch, David Nevins	4 00
Second, William C. Winter	3 00
Carnations. — Display of cut blooms, with foliage, not less than six varieties, in vases, William C. Ward	8 00
Second, William Nicholson	6 00
Camellias. — Display of named varieties, cut flowers with foliage, not less than twelve blooms, of not less than six varieties, James Comley	4 00
Second, James Comley	3 00

Gratuities : —

James Comley, Display of Flowers	3 00
Oakes Ames, " " "	3 00
Mrs. E. M. Gill, " " "	2 00
Peter Fisher, Display of Carnations	1 00

FEBRUARY 8.

Gratuities : —

James Comley, Camellias	3 00
E. Sheppard & Son, Orchids and Cinerarias	2 00
Oakes Ames, Display of Flowers	2 00
Bussey Institution, Forced Shrubs and Anemones	1 00

FEBRUARY 15.

Gratuity : —

James Comley, Display of Flowers	3 00

FEBRUARY 29.

Gratuities : —

James Comley, Display of Flowers	3 00
Mrs. E. M. Gill, " " "	1 00
James Comley, Display of Orchids	1 00

MARCH 7.

Gratuities : —

James Comley, Display of Flowers	4 00
Mrs. E. M. Gill, " " "	1 00

MARCH 14.

Gratuities : —

David Nevins, Hybrid Perpetual Roses	5 00
James Comley, Roses and Lilacs	3 00
H. H. Hunnewell, Amaryllises	2 00
Oakes Ames, Collection of Flowers	2 00

MARCH 21.

Gratuities : —

David Nevins, Hybrid Perpetual Roses	5 00
James Comley, Roses	2 00
Oakes Ames, Flowers	2 00

SPRING EXHIBITION.

MARCH 24, 25, 26, AND 27.

HYBRID PERPETUAL ROSES. — Twelve blooms, of not less than four distinct named varieties, David Nevins	12 00
Second, James Comley	10 00
HYBRID PERPETUAL ROSES. — Six blooms, not less than three named varieties, David Nevins	6 00
Twelve blooms of Ulrich Brunner, G. M. Anderson	10 00
Second, David Nevins	8 00

Tender Roses in Vases. — Twelve blooms of American Beauty, Charles V. Whitten	15 00
Twenty-five blooms of Bridesmaid, William H. Elliott	12 00
Second, Charles V. Whitten	10 00
Twenty-five blooms of Meteor, the second prize to Charles V. Whitten	10 00
Twenty-five blooms of Mrs. J. Pierpont Morgan, John N. May, Summit, N. J.	12 00
Twenty-five blooms of The Bride, William H. Elliott	12 00
Second, Charles V. Whitten	10 00
Twenty-five blooms of Catherine Mermet, William H. Elliott	8 00
Second, Charles V. Whitten	6 00
Twenty-five blooms of Papa Gontier, William H. Elliott	8 00
Vase of fifty blooms of assorted varieties of Roses, David Nevins,	20 00
Second, Charles V. Whitten	16 00
Carnations. — Twenty-five blooms of any Crimson variety, William Nicholson for Ferdinand Mangold	3 00
Twenty-five blooms of any Dark Pink variety (William Scott or darker), William Nicholson for Nickerson	3 00
Second, William Nicholson for William Scott	2 00
Twenty-five blooms of any Light Pink variety (lighter than William Scott), William H. Elliott for Albertina	3 00
Twenty-five blooms of any Scarlet variety, William Nicholson for Hector	3 00
Twenty-five blooms of any White variety, William Nicholson for Crystal	3 00
Twenty-five blooms of any Yellow variety, William Nicholson for Eldorado	3 00
Pansies. — Forty-eight cut blooms, not less than twenty-four varieties, in the Society's flat fruit dishes, Hon. Joseph S. Fay	4 00
Violets. — Bunch of fifty blooms of Czar, Harry S. Rand	2 00
Bunch of fifty blooms of Lady Hume Campbell, David Nevins	2 00
Second, William C. Winter	1 00
Bunch of fifty blooms of Marie Louise, David Nevins	2 00
Second, Harry S. Rand	1 00
Bunch of fifty blooms of any other variety, David Nevins for Swanley White	2 00
Camellias. — Display of named varieties, cut flowers with foliage, not less than twenty-four blooms, of not less than six varieties, Joseph H. White	4 00
Second, James Comley	3 00
Gratuities: —	
David Nevins, Roses and Orchids	15 00
James Comley, Display of Roses, Orchids, etc.	15 00
Oakes Ames, " " "	5 00

James Comley, *Rhododendron Veitchianum* 2 00
Harry S. Rand, Collection of Violets 2 00
George M. Anderson, Vase of Catherine Mermet Roses . . . 1 00
Jason S. Bailey, Spike of *Dendrobium thyrsiflorum* . . . 1 00
Mrs. E. M. Gill, Display of Flowers 1 00

April 4.

Gratuities : —

David Nevins, Display of Roses and Orchids 5 00
James Comley, Display of Roses 5 00
James Comley, Display of Wistarias 2 00

April 11.

Gratuities : —

Charles V. Whitten, Two Vases of Roses 3 00
Hon. Joseph S. Fay, Display of Pansies 2 00
James Comley, Display of Orchids 2 00
James Comley, Display of Flowers 4 00
Oakes Ames, " " " 2 00
Mrs. E. M. Gill, " " " 2 00
Mrs. P. D. Richards, Native Flowers 1 00

April 18.

Gratuities : —

Hon. Joseph S. Fay, Display of Pansies 2 00
Mrs. E. M. Gill, Flowers 1 00
Mrs. P. D. Richards, Native Plants 1 00

April 25.

Gratuity : —

James Comley, Display of Flowers 2 00

MAY EXHIBITION.

May 2.

Hardy Narcissuses. — Collection of not less than ten named varieties of blooms, in vases, Dr. C. G. Weld 5 00
Second, Bussey Institution 4 00
Pansies. — Forty-eight blooms, not less than twenty-four varieties, in the Society's flat fruit dishes, Hon. Joseph S. Fay . . 4 00
Second, Hon. Joseph S. Fay 3 00
Third, Hon. Joseph S. Fay 2 00
Native Plants. — Mrs. P. D. Richards 8 00
Second, Genevieve Doran 6 00
Third, Oakes Ames 4 00

Gratuities : —

Hon. Joseph S. Fay, Display of Pansies	8 00
Botanic Garden of Harvard University, Herbaceous Plants	6 00
Charles V. Whitten, Tulips	3 00
Charles V. Whitten, Vase of Roses	2 00
William Nicholson, Vase of Carnations	1 00
James Comley, Flowers	3 00
Oakes Ames, "	3 00
Mrs. E. M. Gill, "	1 00

MAY 9.

Gratuities : —

Hon. Joseph S. Fay, Pansies	2 00
Oakes Ames, Flowers	4 00
Mrs. P. D. Richards, Native Flowers	3 00

MAY 16.

Gratuities : —

Rea Brothers, Tulips	2 00
James Comley, Flowers	5 00
Mrs. E. M. Gill, "	1 00
Mrs. P. D. Richards, Native Plants	2 00

MAY 28.

Gratuities : —

Oakes Ames, Roses	2 00
James Comley, Flowers	5 00
Mrs. E. M. Gill, "	1 00
Misses Eleanor and Mollie Doran, Native Flowers	1 00
Mrs. P. D. Richards, " "	1 00
Alice L. Grinnell, " "	1 00

RHODODENDRON SHOW.

JUNE 4 AND 5.

H. H. Hunnewell Fund.

RHODODENDRONS. — Twelve distinct varieties, of unquestionable hardiness, named, James Comley, a piece of plate valued at	20 00
Second, Samuel Trepess, a piece of plate valued at	15 00
Six distinct varieties, of unquestionable hardiness, named, John L. Gardner	10 00
Second, James Comley	5 00
Six tender varieties, named, James Comley	5 00
Three tender varieties, named, James Comley	4 00

HARDY AZALEAS. — From any or all classes, fifteen varieties, one vase of each, James Comley 8 00
Twelve varieties, one vase of each, James Comley . . . 4 00
Six varieties, one vase of each, John L. Gardner 3 00
Cluster of Trusses of one variety, Oakes Ames 2 00
Second, John L. Gardner 1 00
HERBACEOUS PÆONIES. — Collection of named varieties, John L. Gardner 6 00
Second, George Hollis 4 00
GERMAN IRISES. — Six distinct varieties, three spikes of each, John L. Gardner 3 00
Second, Walter H. Cowing 2 00
HARDY PYRETHRUMS. — Display, Kenneth Finlayson . . . 4 00
Second, Charles V. Whitten 3 00
HERBACEOUS PLANTS. — Reading Nursery 8 00
Second, Rea Brothers 6 00
NATIVE PLANTS. — Collection not exceeding thirty bottles of named species and varieties, one bottle of each, Mrs. P. D. Richards, 8 00
Second, Oakes Ames 6 00
Third, Misses Eleanor and Mollie Doran 4 00
VASE OF FLOWERS. — Mrs. A. D. Wood 4 00
Second, Mrs. E. M. Gill 3 00

Gratuities: —

H. H. Hunnewell, Rhododendrons 30 00
James Comley, " 25 00
Mrs. Benjamin P. Cheney, Rhododendrons and Azaleas . . . 15 00
John L. Gardner, Rhododendrons, etc. 7 00
Hon. Joseph S. Fay, Cut Shrubs and Flowers 6 00
James Comley, Hardy Trees and Shrubs 5 00
Oakes Ames, Aquatics 6 00
Walter H. Cowing, German Irises 2 00
Walter H. Cowing, Oriental Poppies 2 00
Hon. Joseph S. Fay, Pansies 2 00
Frederick S. Davis, Aquilegias 2 00
Mrs. E. M. Gill, Flowers 2 00
Leverett M. Chase, Flowers 1 00
James Comley, Orchids 1 00

JUNE 13.

HERBACEOUS PÆONIES. — Collection of named varieties, Thomas C. Thurlow 10 00
Second, Dr. C. G. Weld 8 00
Third, George Hollis 6 00
ORIENTAL POPPIES. — Collection, named, Walter H. Cowing . . 3 00

Aquilegias. — Collection, named, Frederick S. Davis	3 00
Second, F. A. Blake	2 00
Third, Walter H. Cowing	1 00
Foxgloves. — Twelve spikes, Walter H. Cowing	2 00

Gratuities: —

James Comley, Rhododendrons, Roses, etc.	15 00
Oakes Ames, Display of Aquatics and Flowers	10 00
Hon. Joseph S. Fay, Roses	10 00
Hon. Joseph S. Fay, Display of Pæonies	5 00
James Comley, Hardy Shrubs	5 00
Hon. Joseph S. Fay, Pæonies	3 00
Oakes Ames, Water Lilies	3 00
Hon. Joseph S. Fay, Collection of Hardy Trees and Shrubs	2 00
Hon. Joseph S. Fay, Roses	2 00
Walter H. Cowing, Spanish Irises	2 00
George Hollis, Display of Seedling Pæonies	2 00
O. B. Hadwen, Display of Pæonies	1 00
Rea Brothers, Display of Perennials	1 00
Mrs. E. M. Gill, Display of Flowers	3 00
Mrs. P. D. Richards, Native Flowers	1 00

ROSE EXHIBITION.

June 23 and 24.

Special Prize Theodore Lyman Fund.

Hardy Roses. — Twenty-four distinct named varieties, three of each variety, Hon. Joseph S. Fay, in money or plate of equal value	25 00
Second, Mrs. J. W. Clark, Pomfret, Conn., in money or plate of equal value	20 00

Special Prizes offered by the Society.

Six blooms of Alfred Colomb, the second prize to Hon. Joseph S. Fay	2 00
Six blooms of Baroness Rothschild, Hon. Joseph S. Fay	3 00
Second, Dr. C. G. Weld	2 00
Six blooms of John Hopper, Hon. Joseph S. Fay	3 00
Six blooms of Marquise de Castellane, Hon. Joseph S. Fay	3 00
Six blooms of Merveille de Lyon, Hon. Joseph S. Fay	3 00
Second, Dr. C. G. Weld	2 00
Six blooms of Mme. Gabriel de Luizet, Hon. Joseph S. Fay	3 00
Second, Dr. C. G. Weld	2 00
Six blooms of Mme. Victor Verdier, Hon. Joseph S. Fay	3 00
Second, Dr. C. G. Weld	2 00

Six blooms of Prince Camille de Rohan, Mrs. J. W. Clark . . 3 00
Second, Hon. Joseph S. Fay 2 00
Twelve blooms of any other variety, Hon. Joseph S. Fay, for Duke of Edinburg 4 00
Second, Mrs. J. W. Clark, for Magna Charta 3 00

Regular Prizes.

Sixteen distinct named varieties, three of each variety, Hon. Joseph S. Fay 15 00
Second, Mrs. J. W. Clark 10 00
Twelve distinct named varieties, three of each, Hon. Joseph S. Fay, 10 00
Second, Dr. C. G. Weld 8 00
Six distinct named varieties, three of each, Hon. Joseph S. Fay . 6 00
Second, Dr. C. G. Weld 4 00
Third, Mrs. J. W. Clark 2 00
Three distinct varieties, named, three of each, Hon. Joseph S. Fay, 3 00
Twenty-four distinct named varieties, one of each, the second prize to Mrs. J. W. Clark 8 00
Third, Hon. Joseph S. Fay 6 00
Eighteen distinct named varieties, one of each, the second prize to James Comley 6 00
Third, Hon. Joseph S. Fay 4 00
Twelve distinct named varieties, one of each, Hon. Joseph S. Fay . 6 00
Six distinct named varieties, one of each, Hon. Joseph S. Fay . 4 00
Second, Dr. C. G. Weld 3 00
Third, Miss Mary S. Walker 2 00
Moss Roses. — Six distinct named varieties, three clusters of each, Dr. C. G. Weld 4 00
Third, Hon. Joseph S. Fay 2 00
Hybrid Tea Roses. — Six named varieties, buds admissible, Hon. Joseph S. Fay 3 00
General Display. — One hundred bottles of Hardy Roses, buds admissible, Hon. Joseph S. Fay 10 00
Second, Mrs. J. W. Clark 9 00
Third, James Comley 8 00
Fourth, Mrs. E. M. Gill 7 00
Fifth, Hon. Joseph S. Fay 6 00
Basket of Roses. — Arranged for effect, to be shown the second day, James Comley 5 00
Second, Mrs. E. M. Gill 3 00
Sweet Williams. — Thirty spikes, not less than six distinct varieties, Samuel Trepess 4 00
Second, Walter H. Cowing 3 00
Third, Oakes Ames 2 00
Fourth, Walter E. Coburn 1 00

VASE OF FLOWERS. — Best arranged, in one of the Society's glass vases, Mrs. A. D. Wood 5 00
Second, Mrs. E. M. Gill 4 00

Gratuities: —

Hon. Joseph S. Fay, Display of Roses 25 00
Hon. Joseph S. Fay, " " " 8 00
Hon. Joseph S. Fay, " " " 5 00
Hon. Joseph S. Fay, Bank of Roses 3 00
Hon. Joseph S. Fay, Display of Mad. Gabriel de Luizet Roses . . 6 00
J. Eaton, jr., Roses 10 00
James Comley, " 10 00
James Comley, " 3 00
James Comley, Stand of Roses 3 00
Dr. C. G. Weld, Roses 8 00
Mrs. J. W. Clark, " 5 00
Patrick Kane, " 4 00
Mrs. E. A. Wilkie, Three Vases of Roses 3 00
William H. Spooner, Display of Roses 3 00
Jackson Dawson, " " " 2 00
Mrs. E. M. Gill, " " " 1 00
L. W. Goodell, Aquatics 10 00
Oakes Ames, " 8 00
Dr. C. G. Weld, Display of Sweet Williams and Roses . . . 4 00
Walter E. Coburn, Pelargoniums 3 00
Rea Brothers, Hardy Perennials 3 00
Walter H. Cowing, English Irises 3 00
Walter E. Coburn, Stand of Sweet Williams 2 00
A. F. Estabrooks, Pæonies 1 00
O. B. Hadwen, " 1 00
Edwin Sheppard, Sweet Williams 1 00
Samuel J. Trepess, Foxgloves 1 00
Oakes Ames, Display of Flowers 10 00
James Comley, Flowers 3 00
Mrs. P. D. Richards, Native Flowers 2 00

JUNE 27.

HARDY ROSES. — Collection, named, not less than twenty-five varieties, filling fifty vases, one rose in each vase, Hon. Joseph S. Fay 15 00
Second, Hon. Joseph S. Fay 10 00
Third, James Comley 6 00
Fourth, Hon. Joseph S. Fay 4 00
IRIS KÆMPFERI. — Six varieties, three of each, in vases, John L. Gardner 4 00
ENGLISH IRISES. — Best collection, Walter H. Cowing . . . 3 00

DELPHINIUMS. — Collection of twenty spikes, not less than five varieties, Dr. C. G. Weld 5 00
Third, Oakes Ames 3 00
CAMPANULA MEDIUM. — Collection, not less than twelve bottles, Dr. C. G. Weld 3 00
HERBACEOUS PLANTS. — Thirty bottles, Reading Nursery . . 8 00
Third, Rea Brothers 4 00
VASE OF FLOWERS. — Mrs. E. M. Gill 4 00
Second, Mrs. A. D. Wood 3 00

Gratuities : —

Hon. Joseph S. Fay, Display of Roses 15 00
James Comley, " " " 10 00
Oakes Ames, " " " 2 00
Patrick Kane, " " " 2 00
Mrs. E. M. Gill, Roses 2 00
William H. Spooner, Display of Roses 1 00
Botanic Garden of Harvard University, Hardy Herbaceous Perennials 12 00
Oakes Ames, Display of Aquatics 5 00
Walter E. Coburn, Pelargoniums and Sweet Peas 3 00
Bussey Institution, Lilies and Delphiniums 2 00
Dr. C. G. Weld, Sweet Williams 1 00
Mrs. E. M. Gill, Flowers 1 00
Mrs. P. D. Richards, Wild Flowers 2 00

JULY 11.

NATIVE PLANTS. — Collection, not exceeding forty bottles of named species and varieties, one bottle of each, Mrs. P. D. Richards, 8 00
Second, Genevieve Doran 6 00
Third, Oakes Ames 4 00
VASE OF FLOWERS. — Best arranged, in one of the Society's glass vases, James Comley 4 00
Second, Mrs. A. D. Wood 3 00

Gratuities : —

Oakes Ames, Display of Aquatics 5 00
Reading Nursery, Hardy Flowers 3 00
Rea Brothers, Hardy Perennials 2 00
Walter H. Cowing, Shirley Poppies 2 00
John Jeffries, Nasturtiums and Japanese Irises 1 00
Hattie B. Winter, Vase of Flowers 1 00
James Comley, Display of Flowers 5 00
Mrs. E. M. Gill, " " " 1 00

JULY 18.

GLOXINIAS. — Twelve vases, cut blooms, three in each vase, arranged with any foliage, Jason S. Bailey	5 00
Second, Dr. C. G. Weld	4 00
Third, James L. Little	3 00
TUBEROUS BEGONIAS. — Twelve vases, three in each vase, arranged with any foliage, Dr. C. G. Weld	4 00
Second, Elisha S. Converse	3 00
HARDY FERNS. — Display of named species and varieties, Oakes Ames	7 00
Second, Mrs. P. D. Richards	5 00
Third, Mrs. Mary E. Loud	3 00

Gratuities: —

Hon. Joseph S. Fay, Hollyhocks, Phloxes, Roses, Larkspurs, etc.	20 00
Hon. John Simpkins, Display of Aquatics	20 00
Oakes Ames, " " "	4 00
Oakes Ames, Roses, Japanese Irises, etc.	3 00
John Jeffries, Antirrhinums	2 00
Rea Brothers, Hardy Plants	2 00
Dr. C. G. Weld, Gloxinias	2 00
Dr. C. G. Weld, Begonias	2 00
Sumner Coolidge, Hardy Carnations	1 00
James Comley, Display of Flowers	8 00
Mrs. E. M. Gill, Flowers	3 00
Arthur E. French, Collection of Sedges and Grasses	3 00

JULY 25.

SWEET PEAS. — Display, filling thirty vases, arranged with any foliage, H. A. Jones	6 00
Second, E. A. Weeks	4 00
Third, Samuel J. Trepess	3 00
Display of named varieties, in vases, six sprays in each vase, H. A. Jones	4 00
Second, E. A. Weeks	3 00
Third, F. A. Blake	2 00
VASE OF FLOWERS. — For table decoration, James Comley	4 00
Second, Hattie B. Winter	3 00

Gratuities: —

Oakes Ames, Display of Aquatics	10 00
James Comley, Display of Flowers	5 00
Mrs. E. M. Gill, " " "	2 00
John Jeffries, " " "	1 00
Mrs. P. D. Richards, Display of Native Plants	1 00

August 1.

Perennial Phloxes. — Ten distinct named varieties, one spike of each, the second prize to John L. Gardner	4 00
Third, George Hollis	3 00
Native Flowers. — Collection, not exceeding forty bottles of named species and varieties, one bottle of each, Mrs. P. D. Richards,	8 00
Second, Miss Genevieve Doran	6 00
Third, Oakes Ames	4 00
Gratuities : —	
Oakes Ames, Aquatics	5 00
Bussey Institution, Montbretias, Sweet Peas, etc.	3 00
Jason S. Bailey, Orchids and Roses	2 00
George Hollis, Display of Phloxes	2 00
E. Sheppard, Phloxes and Zinnias	1 00
John L. Gardner, Phloxes and Gladioli	1 00
A. Lummus, Dahlias	1 00
Arthur F. Coolidge, Verbenas and other Flowers	1 00
Rea Brothers, Hardy Herbaceous Perennials	1 00
James Comley, Display of Flowers	4 00
James Comley, Vase of Flowers	2 00
Mrs. A. D. Wood, Flowers	2 00
Mrs. E. M. Gill, "	1 00
Mrs. E. M. Gill, Vase of Wild Flowers	1 00

August 8.

Annuals. — General display, named, filling not less than one hundred and fifty bottles, Oakes Ames	10 00
Second, Mrs. E. M. Gill	8 00
Third, Miss A. D. Coolidge	6 00
Gratuities : —	
Joseph H. White, Collection of Sweet Peas	3 00
Rev. W. T. Hutchins, Sweet Peas	3 00
Bussey Institution, Sweet Peas, Gladioli, and Montbretias	3 00
J. Warren Clark, Seedling Gladioli	3 00
Botanic Garden of Harvard University, Collection of Hardy Phloxes,	2 00
George Hollis, Cannas and Phloxes	1 00
Rea Brothers, Hardy Perennials	1 00
A. Lummus, Dahlias	1 00
James Comley, Display of Flowers	4 00
William C. Winter, Flowers	1 00

August 15.

Gladioli. — Twenty named varieties, in spikes, J. Warren Clark	6 00
Ten named varieties, in spikes, John Parker	3 00
Second, J. Warren Clark	2 00

Six named varieties, in spikes, J. Warren Clark	2 00
Second, Walter H. Cowing	1 00
Display of named and unnamed varieties, filling one hundred vases, arranged for effect with any foliage, J. Warren Clark	8 00

Gratuities: —

John Jeffries, Drummond Phlox	2 00
Walter H. Cowing, Display of Cannas	2 00
F. A. Blake, Salpiglossis	1 00
F. A. Blake, Petunias	1 00
William E. Endicott, Dahlias	1 00
A. Lummus, "	1 00
James Comley, Display of Flowers	5 00
Oakes Ames, " " "	4 00
Bussey Institution, " " "	3 00
Mrs. E. M. Gill, Flowers	2 00
Alice L. Grinnell, Native Plants	1 00
Mrs. P. D. Richards, " "	1 00

AUGUST 22.

ASTERS. — Large Flowered, of all classes, fifty vases, not less than twelve varieties, three flowers in each vase, James Comley	4 00
Second, F. A. Blake	3 00
Third, Sumner Coolidge	2 00
Victoria Flowered, thirty blooms, not less than twelve varieties, Charles H. Souther	3 00
Second, Elisha S. Converse	2 00

Gratuities: —

Botanic Garden of Harvard University, Herbaceous Plants	8 00
J. Woodward Manning, *Nelumbium luteum*	3 00
A. Lummus, Dahlias	2 00
L. W. Goodell, Drummond Phlox	2 00
L. W. Goodell, Salpiglossis	2 00
Mrs. H. J. Stockford, Begonias and Sweet Peas	1 00
Edwin Sheppard, China Asters	1 00
John Parker, Gladioli, etc.	1 00
Bussey Institution, Flowers	1 00
James Comley, "	2 00
George Hollis, "	1 00
Mrs. E. M. Gill, "	1 00
Mrs. P. D. Richards, Native Plants	1 00

ANNUAL EXHIBITION OF PLANTS AND FLOWERS.

September 2 and 3.

Special Prize, Theodore Lyman Fund.

Aquatic Plants. — General Display of Nymphæas, Nelumbiums, and other Aquatic Plants, to include not less than twenty-five blooms of Nymphæas, Hon. John Simpkins 50 00

Display of twelve Nymphæas and Nelumbiums, the second prize to Oakes Ames 8 00

Regular Prizes.

Dahlias. — Double, twelve blooms, distinct named varieties, H. F. Burt 5 00

Second, John Parker 4 00

Third, Lothrop & Higgins 3 00

Six blooms, distinct named varieties, H. F. Burt 3 00

Second, Lothrop & Higgins 2 00

Third, L. W. Snow 1 00

Specimen bloom, Lothrop & Higgins 2 00

Second, L. W. Snow 1 00

Liliputian Dahlias, Display of twenty-five bottles, not less than eight named varieties, L. W. Snow 4 00

Second, William C. Winter 3 00

Third, A. Lummus 2 00

Single Dahlias, Display of not less than eight varieties, William E. Endicott 2 00

Cactus Dahlias, Display filling eighteen bottles, not less than six varieties, H. F. Burt 5 00

Second, William E. Endicott 4 00

Lilium Lancifolium. — Collection of named varieties, Sumner Coolidge 4 00

Tropæolums. — Display, with their own foliage, filling twenty-five vases, Dr. C. G. Weld 4 00

Second, Miss A. L. Cain 3 00

Third, James Comley 2 00

Marigolds. — Display of French and African, filling twenty-five vases, James Comley 3 00

Second, Charles H. Souther 2 00

Cannas. — Collection of not less than ten named varieties, in spikes, with foliage, James L. Little 10 00

Second, Walter H. Cowing 8 00

Third, James Farquhar 6 00

Fourth, Christian Johnson 4 00

Double Zinnias. — Twenty-five flowers, not less than six varieties, James Comley	4 00
Second, Frederick S. Davis	3 00
Third, Oakes Ames	2 00
Dianthuses. — Collection not exceeding forty bottles, of named species and varieties, one bottle of each, L. W. Goodell	3 00
Native Plants. — Collection not exceeding forty bottles, of named species and varieties, one bottle of each, Mrs. P. D. Richards,	8 00
Second, Miss Genevieve Doran	6 00
Third, Misses Eleanor and Mollie Doran	4 00
Vase of Flowers. — For table decoration, on the last day of the exhibition, Hattie B. Winter	4 00

Gratuities: —

Oakes Ames, Collection of Aquatic Plants	12 00
Henry A. Dreer, Philadelphia, Penn., Collection of Aquatic Plants,	12 00
L. W. Goodell, Collection of Aquatic Plants	12 00
W. W. Rawson, Display of Dahlias	10 00
William C. Winter, Collection of Dahlias	2 00
T. C. Thurlow, Forty-three named varieties of Phlox	5 00
James Comley, Pyramid of Asters	4 00
L. W. Goodell, Phlox, Asters, and Salpiglossis	3 00
F. A. Blake, Asters	1 00
Norris R. Comley, Cockscombs	1 00
James L. Little, *Tydæa hybrida grandiflora*	1 00
A. B. Howard, Verbenas and Pompon Zinnias	1 00
James Comley, Display of Flowers	3 00
Bussey Institution, Flowers	1 00
John Jeffries, "	1 00
Mrs. E. M. Gill, "	1 00
Mrs. J. A. Cain, "	1 00

September 12.

Gratuities: —

John J. Colan, Cockscombs	2 00
John Parker, Dahlias	1 00
E. Sheppard, "	1 00
Mrs. E. M. Gill, Flowers	1 00

September 19.

Perennial Asters. — Display of native or introduced species and varieties, Mrs. P. D. Richards	5 00
Third, Misses Eleanor and Mollie Doran	3 00

Gratuities: —

A. Lummus, Named Dahlias	2 00
John Jeffries, Coleus, Dahlias, etc.	2 00
J. Woodward Manning, Flowers	1 00
Mrs. E. M. Gill, "	1 00

October 16.

Gratuity : —

Hon. John Simpkins, Display of Early Chrysanthemums . . . 6 00

October 24.

Gratuities : —

James Comley, Chrysanthemums and Cosmos 3 00
Mrs. E. M. Gill, Chrysanthemums 1 00

October 31.

Gratuities : —

Hon. John Simpkins, Two vases of Chrysanthemum, Mrs. Henry Robinson 5 00
James Comley, Display of Flowers 4 00
Hon. John Simpkins, New Seedling Chrysanthemum . . . 2 00

CHRYSANTHEMUM SHOW.

November 10, 11, 12, and 13.

Special Prize from the Josiah Bradlee Fund.

Twenty-five blooms, of twenty-five distinct varieties, named, Hon. John Simpkins, a piece of plate, or value in money . . 20 00
Second, Mrs. Benjamin P. Cheney 15 00
Third, Joseph H. White 10 00
Six vases, of six named varieties, ten blooms of each, Waban Conservatories 30 00
Second, Mrs. Benjamin P. Cheney 25 00
Third, J. W. Howard 20 00

Special Prizes offered by the Society.

Best Seedling, never disseminated, six blooms, Pink, J. Eaton, jr. . 5 00
Best Seedling, never disseminated, six blooms, White, J. Eaton, jr., 5 00
Best Seedling, never disseminated, six blooms, any other color, Charles Souther 5 00
Best Seedling, never disseminated, six blooms Incurved, of any color, Joseph H. White, for Li Hung Chang 5 00

Regular Prizes.

Twelve blooms, Incurved, named, in vases, Joseph H. White . . 8 00
Second, John Jeffries 6 00
Twelve blooms, Japanese, named, in vases, Hon. John Simpkins . 10 00
Second, Joseph H. White 6 00
Third, William Slack 4 00

Twelve blooms, Japanese Incurved, named, in vases, John Simpkins	10 00
Second, Mrs. Benjamin P. Cheney	6 00
Third, Joseph H. White	4 00
Twelve blooms, Anemone, named, in vases, J. W. Howard	8 00
Second, James L. Little	6 00
Third, William Slack	4 00
Six blooms Incurved, named, in vases, Charles H. Souther	5 00
Second, Elisha S. Converse	4 00
Third, Joseph H. White	2 00
Six blooms, Japanese, named, in vases, Charles H. Souther	6 00
Third, Joseph H. White	2 00
Six blooms, Japanese Incurved, named, in vases, Charles H. Souther,	6 00
Second, Joseph H. White	4 00
Third, Mrs. Benjamin P. Cheney	2 00
Six blooms Reflexed, named, in vases, Joseph H. White	6 00
Second, Mrs. Benjamin P. Cheney	4 00
Third, Charles H. Souther	2 00
Six blooms, Anemone, named, in vases, Elisha S. Converse	5 00
Second, James L. Little	4 00
Third, William Slack	2 00
Twelve sprays, Pompons, not less than six named varieties, J. W. Howard	3 00
Second, William Slack	2 00
Twelve best varieties, named, introductions of the current year, Joseph H. White	8 00
Second, J. W. Howard	6 00
Vase of blooms on long stems, arranged in the Society's large china vases, to be kept in good condition during the exhibition, Hon. John Simpkins	20 00
Second, Hon. John Simpkins	18 00
Third, David Nevins	16 00
Fourth, Mrs. Benjamin P. Cheney	14 00
Fifth, Charles H. Souther	12 00
Sixth, J. W. Howard	10 00
Seventh, James Comley	8 00
Best vase of ten blooms on long stems, Pink, named, Mrs. Benjamin P. Cheney, for Viviand-Morel	10 00
Second, Mrs. Benjamin P. Cheney, for Mrs. Perin	8 00
Third, James L. Little, for Viviand-Morel	6 00
Best vase, ten blooms, on long stems, Red, named, Waban Conservatory, for Edwin Molyneux	10 00
Second, Mrs. Benjamin P. Cheney, for John Shrimpton	8 00
Third, James L. Little, for Egyptian	6 00
Best vase of ten blooms, on long stems, White, named, Waban Conservatories, for Mrs. Jerome Jones	10 00
Second, Mrs. Benjamin P. Cheney, for Mrs. W. H. Phipps	8 00
Third, James L. Little, for Mrs. Jerome Jones	6 00

Best vase of ten blooms, on long stems, Yellow, named, Waban Conservatories, for Eugene Dailledouze	10 00
Second, Mrs. Benjamin P. Cheney, for Major Bonnafon	8 00
Third, Mrs. Benjamin P. Cheney, for Eugene Dailledouze	6 00
Best vase of ten blooms, on long stems, any other color, Mrs. Benjamin P. Cheney, for Mrs. George West	10 00
Second, J. W. Howard, for Charles Davis	8 00
Third, Elisha S. Converse, for Hicks Arnold	6 00

Gratuities: —

Mrs. E. M. Gill, Chrysanthemums	7 00
William Nicholson, Chrysanthemums and Carnations	5 00
John Jeffries, Display	5 00
James Comley, Chrysanthemums	4 00
Elisha S. Converse, Chrysanthemums	3 00
Hon. John Simpkins, two vases of Chrysanthemums	3 00
Joseph H. White, Display of Chrysanthemums	3 00
Norton Brothers, *Cattleya Bowringiana*	2 00
David Nevins, Violets	1 00

NOVEMBER 21.

Gratuities: —

James Comley, Display of Flowers	3 00
Mrs. E. M. Gill, " " "	1 00

SOCIETY'S SILVER MEDALS.

June 13. Jackson Dawson, for Collection of New Seedling Roses, hybrids of *Rosa multiflora*.

" " Jackson Dawson, for New Rose, cross between *Rosa Wichuraiana* and General Jacqueminot.

Rose Show, June 23. John Jeffries, for Japanese Pæonies.

July 25. Botanic Garden of Harvard University, for Display of Herbaceous Plants.

August 8. Botanic Garden of Harvard University, for Superior Collection of Annuals.

Chrysanthemum Show, November 10. Ernest Asmus, Hoboken, N. J., for Rose Souvenir de Président Carnot.

APPLETON SILVER MEDAL.

Mrs. P. D. Richards, for Native Plants.

FIRST CLASS CERTIFICATES OF MERIT.

Rose Show, June 23. Oakes Ames, for Sweet Williams.

" " " " Hon. Joseph S. Fay, for Rose Lillian Nordica.

August 8. Rea Brothers, for *Rudbeckia laciniata* var. *Golden Glow.*
" " Jacob W. Manning, for *Rudbeckia laciniata* var. *Golden Glow.*
" " Henry A. Dreer, Philadelphia, Pa., for Nelumbium Shiroman.
" " Rev. W. T. Hutchins, for New Unnamed Sweet Pea.
Annual Exhibition of Flowers, September 2. Carl Blomberg, for New Nymphæa, Mrs. Anna C. Ames.
" " " " " " Miss Eliza Wellington, for Superior Cultivation of *Clianthus Dampieri.*
" " " " " " J. F. Huss, for *Pennisetum Ruppelii.*
Chrysanthemum Show, November 10. François Supiot, West Philadelphia, Pa., for Violet Luxonne.
" " " " François Supiot, for Violet Princess des Galles.

HONORABLE MENTION.

February 1. William C. Ward, for Carnation Meteor.
" " William C. Ward, for Carnation Bridesmaid.
June 13. Jackson Dawson, for Seedling Rose from Boston Belle.
June 27. Michael H. Walsh, for New Rose Joseph S. Fay.
August 8. Henry A. Dreer, for *Nymphæa O'Marana.*
Annual Exhibition of Flowers, September 2. James Comley, for New Perennial Pea.
Chrysanthemum Show, November 10. François Supiot, for Violet Admiral Avallon.

COMPLIMENTARY NOTICE.

May 23. R. & J. Farquhar & Co., for Canna Italia.
Chrysanthemum Show, November 10. John Breitmeyer & Sons, Detroit, Mich., for Seedling Chrysanthemum.

REPORT

OF THE

COMMITTEE ON FRUITS,

FOR THE YEAR 1896.

By E. W. WOOD, Chairman.

The fruit exhibitions during the past season have been more than usually irregular, and considerably below the average of recent years. Apples have been abundant and of excellent quality, exhibitors finding little difficulty in selecting perfect specimens. The Pear crop has been a partial failure.

At the Annual Exhibition there were no specimens noticeable for superior excellence. Very few Peaches of open culture have been shown, and those were of inferior quality. Plums have been shown in less quantity than usual. Some of the Japanese varieties of this fruit which have received favorable notice have been found to be more tender than the old kinds under general cultivation, and we would caution purchasers of the Japanese varieties against the danger of introducing the San José scale into their gardens and orchards, as these trees have been sent out largely from nurseries in New Jersey to other nurseries and growers all over the country, and have been found to be seriously infected with this pest.

Small fruits were shown in about the usual quantity. Grapes, with the exception of the foreign varieties, were not up to the standard either in the size of the bunches or in general appearance. Among commercial growers the practice of girdling the vines is increasing, some asserting that if they could not thus secure the earlier ripening and larger bunches of more attractive

appearance, they would give up the cultivation of this fruit, on account of the competition and low prices prevailing when the crop matures naturally and grapes are sent to this market in large quantities from locations outside the State. The practice of girdling is worthy of the attention of amateur growers, as by its application and by spraying the vines with the copper solutions or Bordeaux mixture the crosses with foreign varieties, which are more subject to mildew than pure natives, may be successfully grown. Girdling is not adapted to varieties having compact bunches, like Moore's Early and Delaware, as the increased size of the berries causes cracking and decay; but the value of the Concord and Worden, the two kinds of dark grapes most widely cultivated, may be increased by the operation.

Strawberries came through the winter in good condition, but set their fruit irregularly, some varieties being affected more than others and producing but a partial crop. At the Strawberry Exhibition some excellent fruit was shown, the Marshall easily taking the lead as an exhibition variety. This is the first season growers for market have given any considerable space to this variety, and the complaint was made that it did not prove as productive as some other kinds. Possibly the peculiarity of the season had something to do with this result, but its large size, superior quality, and fine appearance will make it desirable for the garden, and further experience may make it profitable for the commercial grower. It evidently requires rich soil and high cultivation to secure satisfactory results.

The public showed a growing interest in the exhibitions throughout the season by an increased attendance; these exhibitions afford those interested in fruit growing the best opportunity to learn by comparison the most desirable varieties for cultivation.

The prices received by fruit growers for their product has been, like the crop, unusually irregular. As a result of the over supply of apples for the home market, a larger quantity has been sent to foreign ports than in any previous year, and the returns from the earlier shipments were often unsatisfactory. Pears, owing to the short crop, brought higher prices than have prevailed in recent years. The small fruits brought fair prices and met with a ready sale.

George W. Campbell, Delaware, O., has entered his new grape, Campbell's Early, for the Special Prize offered from the Benjamin

B. Davis Fund, sending samples of the fruit in August, September, and October.

Although the Committee offered in prizes $136 more than their appropriation, owing to the partial failure in several lines of fruit they have awarded in prizes and gratuities only $1,527, leaving an unexpended balance of $273.

E. W. Wood,
C. F. Curtis,
Samuel Hartwell,
Warren Fenno,
} *Committee.*

PRIZES AND GRATUITIES AWARDED FOR FRUITS.

1896.

February 1.

Gratuity : —

Leverett M. Chase, Anjou Pears $1 00

March 7.

Gratuity : —

Charles H. Hovey, Pasadena, Cal., Navel Oranges 3 00

SPRING EXHIBITION.

March 24, 25, 26, and 27.

Winter Apples. — Baldwin, J. V. Fletcher 3 00
Second, Samuel Hartwell 2 00
Third, Marshall W. Chadbourne 1 00
Northern Spy, George V. Fletcher 3 00
Second, William T. Hall 2 00
Third, Samuel Hartwell 1 00
Roxbury Russet, George H. Dickerman 3 00
Second, Joshua C. Stone 2 00
Third, Benjamin P. Ware 1 00
Any other variety, George V. Fletcher, Rhode Island Greening . 3 00
Second, M. W. Chadbourne, Hubbardston 2 00
Third, Samuel Hartwell, Blue Pearmain 1 00
Winter Pears. — Any variety, George V. Fletcher, Dana's Hovey, 3 00
Second, Leverett M. Chase, Anjou 2 00

Gratuities : —

Charles H. Hovey, Pasadena, Cal., Oranges and Lemons . . 3 00
B. K. Bliss, Navel Oranges 2 00

June 4.

Gratuities : —

James Comley, Peaches 3 00
William H. Hunt, Strawberries 1 00
William C. Winter, Grapes 1 00

June 13.

Gratuities : —

James Comley, Peaches 2 00
Hon. Joseph S. Fay, Marshall Strawberries 2 00
Charles S. Smith, Bubach Strawberries 1 00
William G. Prescott, Strawberries 2 00
William Doran & Son, Collection of Strawberries 2 00

ROSE AND STRAWBERRY EXHIBITION.

June 23 and 24.

Special Prizes from the Theodore Lyman Fund.

Strawberries. — For the best four quarts of any variety, Warren Heustis & Son, for Marshall, the Lyman Plate, value	20 00
Second, Marshall F. Ewell, for Marshall, the Lyman Plate, value	16 00
Third, Hon. Joseph S. Fay, " " " "	12 00
Fourth, Barnard Farm, " " " "	10 00
Fifth, Sumner Coolidge, " " " "	8 00

Special Prizes offered by the Society.

For the best two quarts of any variety, to be judged by points, Marshall F. Ewell, Marshall	6 00
Second, Hon. Joseph S. Fay, Marshall	5 00
Third, Warren Heustis & Son, Marshall	4 00
Fourth, Sumner Coolidge, Marshall	3 00

Regular Prizes.

For the largest and best collection, not less than twenty baskets of two quarts each, and not less than five varieties, George F. Wheeler	25 00
Ten baskets, not less than three varieties, two quarts each, George F. Wheeler	15 00
Second, George V. Fletcher	12 00
Third, Isaac E. Coburn	10 00
Five baskets, of one variety, two quarts each, Marshall F. Ewell	8 00
Second, Warren Heustis & Son	6 00
Third, George F. Wheeler	5 00
Fourth, Samuel Hartwell	4 00
Fifth, W. D. Hinds	3 00
Two quarts of Belmont, George V. Fletcher	4 00
Second, Barnard Farm	3 00
Third, Samuel Hartwell	2 00
Bubach, Sumner Coolidge	4 00
Second, Oliver R. Robbins	3 00
Third, George F. Wheeler	2 00
Champion, Barnard Farm	4 00
Second, George F. Wheeler	3 00
Third, Bordman Kenrick	2 00
Charles Downing, Miss Mary S. Walker	4 00
Second, Samuel Hartwell	3 00
Third, William Doran & Son	2 00
Crescent, the second prize to Isaac E. Coburn	3 00

Haverland, William Doran & Son 4 00
Second, Isaac E. Coburn 3 00
Third, George F. Wheeler 2 00
Hersey, George F. Wheeler 4 00
Second, William G. Prescott 3 00
Jessie, George V. Fletcher 4 00
Second, Isaac E. Coburn 3 00
Third, George F. Wheeler 2 00
Leader, George F. Wheeler 4 00
Second, Samuel Wheeler 3 00
Third, Isaac E. Coburn 2 00
Marshall, Marshall F. Ewell 4 00
Second, Hon. Joseph S. Fay 3 00
Third, Warren Heustis & Son 2 00
Miner's Prolific, George F. Wheeler 4 00
Parker Earle, George F. Wheeler 4 00
Sharpless, Samuel Hartwell 4 00
Any other variety, Barnard Farm, Timbrell 4 00
Second, J. D. Gowing, Seedling 3 00
Third, Elliot Moore 2 00
Collection, not less than six varieties, one quart of each, Sumner Coolidge 8 00
Second, George F. Wheeler 6 00
One quart of any new variety not previously exhibited, J. D. Gowing, Seedling 3 00
Second, A. R. Howard, Seedling 2 00
Cherries. — Two quarts of any variety, Edwin Hastings . . 4 00
Second, George V. Fletcher 3 00
Third, Charles S. Smith 2 00
Foreign Grapes. — Two bunches of any variety, Elisha S. Converse 6 00
Second, Elisha S. Converse 4 00
Forced Peaches. — Six specimens of any variety, James Comley, Stephenson 3 00
Second, William C. Winter, Amsden 2 00

Gratuity : —

James Comley, Peaches 2 00

June 27.

Strawberries. — One quart of any variety, Marshall F. Ewell, Marshall 3 00
Second, Warren Heustis & Son, Marshall 2 00
Third, Hon. Joseph S. Fay, Marshall 1 00
Cherries. — Two quarts of Black Eagle, Samuel G. Damon . . 3 00
Two quarts of Downer's Late, M. W. Chadbourne . . . 3 00
Any other variety, the second prize to E. S. Chapell, Napoleon . 2 00
Third, Wilfred Wheeler, Richmond 1 00

JULY 11.

RASPBERRIES. — Two quarts of any variety, William Doran & Son, Red Antwerp 3 00
Second, Elisha S. Converse 2 00
CURRANTS. — Two quarts of any Red variety, Sumner Coolidge, Fay's 4 00
Second, William Doran & Son, Fay's 3 00
Third, Samuel G. Damon, Versaillaise 2 00
Fourth, Benjamin G. Smith, Versaillaise 1 00
Two quarts of any White variety, Nathaniel T. Kidder, White Grape 3 00
Second, Elisha S. Converse, White Grape 2 00
Third, Benjamin G. Smith, Dana's New White 1 00
GOOSEBERRIES. — Two quarts of any Native variety, Joseph S. Chase, Triumph 3 00
Second, Dr. Walter G. Kendall, Columbus 2 00
Third, Warren Heustis & Son, Downing 1 00

Gratuities: —

William C. Winter, Foreign Grapes 1 00
Robert Manning, Florence Cherries 1 00
E. S. Chapell, Napoleon Cherries 1 00
James Comley, Peaches 2 00

JULY 18.

RASPBERRIES. — Two quarts of any variety, Mrs. E. J. Cutter, Cuthbert 3 00
Second, Benjamin G. Smith, Knevett's Giant 2 00
Third, Elisha S. Converse, Cuthbert 1 00
CURRANTS. — One quart of any Red variety, William Doran & Son, Versaillaise 3 00
Second, Sumner Coolidge, Fay's 2 00
Third, Samuel J. Trepess, Versaillaise 1 00
One quart of any White variety, Samuel J. Trepess, White Grape, 2 00
Second, Elisha S. Converse, White Grape 1 00
GOOSEBERRIES. — Two quarts of any Foreign variety, Benjamin G. Smith, Hero of the Nile 3 00
Second, Benjamin P. Ware, English Fancy 2 00
Third, Benjamin G. Smith, Abbotsford 1 00

Gratuity: —

Warren Heustis & Son, Collection 1 00

JULY 25.

BLACKBERRIES. — Two quarts of any variety, Rev. Calvin Terry, Dorchester 3 00
Second, Rev. Calvin Terry, Kittatinny 2 00

Apples. — Tetofsky, George Nelson	3 00
Second, James Comley	2 00
Third, David L. Fiske	1 00
Pears. — Summer Doyenne, Sumner Coolidge	3 00
Second, Elisha S. Converse	2 00
Third, David L. Fiske	1 00
Peaches. — Six of any variety, William C. Winter	3 00
Gratuity: —	
Mrs. E. J. Cutter, Raspberries	1 00

August 1.

Apples. — Red Astrachan, Samuel Hartwell	3 00
Second, Samuel G. Damon	2 00
Third, Charles F. Curtis	1 00
Sweet Bough, George V. Fletcher	3 00
Second, Charles B. Travis	2 00
Third, Sumner Coolidge	1 00
Any other variety, A. M. Knowlton, Yellow Transparent	3 00
Second, George Nelson, Yellow Transparent	2 00
Third, C. C. Shaw, Early Harvest	1 00
Pears. — Giffard, A. T. Brown	3 00
Second, Mrs. Emmons	2 00
Third, Samuel G. Damon	1 00
Any other variety, Sumner Coolidge	3 00
Second, A. T. Brown	2 00
Third, Mrs. S. Klaus	1 00
Blackberries. — Two quarts of any variety, M. W. Chadbourne	3 00
Second, E. W. Wood	2 00
Third, Sumner Coolidge	1 00
Gratuity: —	
James Comley, Collection of Apples	1 00

August 8.

Apples. — Oldenburg, George C. Rice	3 00
Second, E. R. Cook	2 00
Third, J. V. Fletcher	1 00
Any other variety, Luke Tuttle, Red Astrachan	3 00
Second, Charles B. Travis, Sweet Bough	2 00
Third, Samuel Hartwell, Summer Pippin	1 00
Pears. — Clapp's Favorite, Sumner Coolidge	3 00
Second, George V. Fletcher	2 00
Third, Mrs. S. Klaus	1 00
Any other variety, the second prize to Samuel G. Damon, Giffard	2 00
Third, Mrs. Emmons, Giffard	1 00

PEACHES. — Six specimens of cold house or pot culture, of any variety, Elisha S. Converse 3 00
Second, William C. Winter 2 00
FOREIGN GRAPES. — Two bunches of any variety, Elisha S. Converse, Foster's Seedling 5 00
Second, Elisha S. Converse, Black Hamburg 4 00

AUGUST 15.

APPLES. — Chenango, Sumner Coolidge 3 00
Second, Charles F. Curtis 2 00
Third, P. G. Hanson 1 00
Williams, Joshua C. Stone 3 00
Second, Charles F. Curtis 2 00
Third, Elisha S. Converse 1 00
Any other variety, Samuel Hartwell, Summer Pippin . . . 3 00
Second, Samuel Hartwell, Gravenstein 2 00
Third, Samuel Hartwell, Bietigheimer 1 00
PEARS. — Rostiezer, Elisha S. Converse 3 00
Second, M. W. Chadbourne 2 00
Third, S. F. & F. L. Weston 1 00
Tyson, John L. Bird 3 00
Second, Warren Fenno 2 00
Third, Leverett M. Chase 1 00
Any other variety, Sumner Coolidge, Clapp's Favorite . . . 3 00
Second, Mrs. S. Klaus, Clapp's Favorite 2 00
Third, A. T. Brown, Bartlett 1 00
PLUMS. — Any variety, George V. Fletcher, Bradshaw . . . 3 00
Second, E. R. Cook, Greeley 2 00
Third, Rev. Calvin Terry, Columbia 1 00

AUGUST 22.

APPLES. — Foundling, Samuel Hartwell 3 00
Gravenstein, David L. Fiske 3 00
Second, E. W. Fiske 2 00
Third, Samuel Hartwell 1 00
Maiden's Blush, E. R. Cook 3 00
Second, Joshua C. Stone 2 00
Third, Dr. Walter G. Kendall 1 00
Porter, George V. Fletcher 3 00
Second, Samuel G. Damon 2 00
Third, Sumner Coolidge 1 00
Summer Pippin, Samuel Hartwell 3 00
Second, Warren Fenno 2 00
Any other variety, O. B. Hadwen, Somerset 3 00
Second, Samuel Hartwell, Bietigheimer 2 00
Third, Joshua C. Stone, Williams 1 00

Pears. — Andrews, Elisha S. Converse	3 00
Second, Joshua C. Stone	2 00
Bartlett, Mrs. S. Klaus	3 00
Second, Sumner Coolidge	2 00
Third, Samuel G. Damon	1 00
Souvenir du Congrès, Warren Fenno	3 00
Second, Samuel Hartwell	2 00
Any other variety, H. K. W. Hall, Clapp's Favorite	3 00
Second, Mrs. S. Klaus, Clapp's Favorite	2 00
Third, A. T. Brown, Flemish Beauty	1 00
Plums. — Bradshaw, George V. Fletcher	3 00
Second, William H. Hunt	2 00
Third, L. W. Goodell	1 00
Any other variety, E. R. Cook, Jefferson	3 00
Second, David L. Fiske, Seedling	2 00
Third, Rev. Calvin Terry, Columbia	1 00

ANNUAL EXHIBITION OF PLANTS AND FLOWERS.

September 2 and 3.

Foreign Grapes. — Four varieties, two bunches each, Mrs. J. W. Clark, Pomfret, Conn.	10 00
Second, Elisha S. Converse	8 00
Two bunches of Black Alicante, Mrs. J. W. Clark	5 00
Second, Elisha S. Converse	4 00
Two bunches of Black Hamburg, Mrs. J. W. Clark	5 00
Second, Joseph H. White	4 00
Two bunches of Golden Hamburg, Mrs. J. W. Clark	5 00
Two bunches of Muscat of Alexandria, Mrs. J. W. Clark	5 00
Second, Joseph H. White	4 00

September 12.

Apples. — Foundling, C. M. Handley	3 00
Second, Samuel Hartwell	2 00
Third, W. H. Teele	1 00
Garden Royal, C. M. Handley	3 00
Third, Benjamin G. Smith	1 00
Gravenstein, Samuel Hartwell	3 00
Second, David L. Fiske	2 00
Third, George V. Fletcher	1 00
Maiden's Blush, H. R. Kinney	3 00
Second, Orlendo W. Dimick	2 00
Third, Joshua C. Stone	1 00

Porter, C. M. Handley	3 00
Second, George V. Fletcher	2 00
Third, F. J. Kinney	1 00
Pumpkin Sweet, Samuel Hartwell	3 00
Second, George W. Stevens	2 00
Third, Samuel G. Damon	1 00
Any other variety, L. J. Fosdick, Seedling	3 00
Second, C. M. Handley, Wealthy	2 00
Third, C. M. Handley, Fall Orange or Holden	1 00
Crab Apples. — Transcendent, L. J. Fosdick	2 00
Second, George W. Stevens	1 00
Any other variety, Orlendo W. Dimick	2 00
Second, Joshua C. Stone	1 00
Pears. — Bartlett, George V. Fletcher	3 00
Second, Sumner Coolidge	2 00
Third, Charles F. Curtis	1 00
Belle Lucrative, Elisha S. Converse	3 00
Second, A. T. Brown	2 00
Boussock, Charles F. Curtis	3 00
Second, Elmer E. Chipman	2 00
Third, David L. Fiske	1 00
Hardy, David L. Fiske	2 00
Second, Warren Fenno	1 00
Paradise of Autumn, William Milman	3 00
Second, David L. Fiske	2 00
Third, Warren Fenno	1 00
Any other variety, William Milman, Seckel	3 00
Second, A. T. Brown, Seckel	2 00
Third, Warren Fenno, Adams	1 00
Plums. — Imperial Gage, George V. Fletcher	3 00
Second, William H. Hunt	2 00
Third, Mrs. M. T. Goddard	1 00
Lombard, John L. Bird	3 00
Second, Mrs. S. Klaus	2 00
Third, Mrs. Mary T. Goddard	1 00
Any other variety, Mrs. Mary T. Goddard, Pond's Seedling	3 00
Second, Mrs. Mary T. Goddard, Golden Egg	2 00
Third, William H. Hunt, Pond's Seedling	1 00
Native Grapes. — Six bunches of Eumelan, Benjamin G. Smith	3 00
Six bunches of Massasoit, F. J. Kinney	3 00
Second, Benjamin G. Smith	2 00
Third, Samuel G. Damon	1 00
Six bunches of Moore's Early, Oliver R. Robbins	3 00
Second, Samuel G. Damon	2 00
Third, George W. Jameson	1 00
Six bunches of any other variety, Joseph S. Chase, Delaware	3 00
Second, F. J. Kinney, Worden	2 00
Third, Joseph S. Chase, Ulster Prolific	1 00

Six bunches of any variety from girdled vines, F. J. Kinney, Worden 3 00
Second, F. J. Kinney, Concord 2 00
Figs. — Any variety, William McRoberts 2 00

ANNUAL EXHIBITION OF FRUITS AND VEGETABLES.

October 1 and 2.

Special Prizes.

Samuel Appleton Fund.

Apples. — Baldwin, Joshua C. Stone 5 00
Hubbardston, C. M. Handley 5 00
Pears. — Sheldon, Samuel G. Damon 5 00

Benjamin V. French Fund.

Apples. — Gravenstein, Samuel Hartwell 5 00
Rhode Island Greening, Henry E. Rich 5 00

Marshall P. Wilder Fund.

Pears. — Anjou, Mrs. S. Klaus 4 00
Second, David L. Fiske 3 00
Third, Samuel Hartwell 2 00
Fourth, A. T. Brown 1 00
Bartlett, George V. Fletcher 4 00
Second, Samuel G. Damon 3 00
Grapes. — Twelve bunches of Concord, George W. Jameson . 4 00
Second, F. J. Kinney 3 00
Third, William Doran & Son 2 00
Fourth, John Parker 1 00
Twelve bunches of Worden, F. J. Kinney 4 00
Second, Samuel Hartwell 3 00
Third, H. R. Kinney 2 00
Fourth, William C. Winter 1 00

Special Prizes offered by the Society.

Pears. — Anjou, Samuel G. Damon 5 00
Seckel, Samuel Hartwell 5 00
Native Grapes. — Twelve bunches of any variety, Joseph S. Chase 5 00

Regular Prizes, Theodore Lyman Fund.

Apples. — Baldwin, Henry E. Rich 4 00
Second, John W. Clark 3 00
Third, A. M. Knowlton 2 00

Dutch Codlin, Warren Fenno	3 00
Fall Orange or Holden, C. M. Handley	3 00
Second, H. R. Kinney	2 00
Third, Henry E. Rich	1 00
Fameuse, George V. Fletcher	3 00
Second, Benjamin G. Smith	2 00
Third, Mrs. C. N. S. Horner	1 00
Fletcher Russet, William H. Teele	3 00
Second, Charles F. Curtis	2 00
Third, George V. Fletcher	1 00
Foundling, C. M. Handley	4 00
Second, Samuel Hartwell	3 00
Gloria Mundi, Samuel Hartwell	3 00
Second, E. R. Cook	2 00
Golden Russet, Henry E. Rich	2 00
Second, Mrs. Mary T. Goddard	1 00
Gravenstein, George V. Fletcher	4 00
Second, Samuel Hartwell	3 00
Third, C. C. Shaw	2 00
Hubbardston, C. B. Lancaster	4 00
Second, Joshua C. Stone	3 00
Third, C. M. Handley	2 00
Hunt Russet, William H. Teele	3 00
Second, William H. Hunt	2 00
Third, Samuel Hartwell	1 00
Jacobs Sweet, Charles F. Curtis	3 00
Lady's Sweet, A. M. Knowlton	2 00
Second, William H. Teele	1 00
Mackintosh, George C. Rice	3 00
Second, Samuel Hartwell	2 00
Third, E. C. Stone	1 00
Maiden's Blush, H. R. Kinney	2 00
Second, Joshua C. Stone	1 00
Mother, David L. Fiske	3 00
Second, H. R. Kinney	2 00
Third, William H. Teele	1 00
Northern Spy, George V. Fletcher	3 00
Second, George C. Rice	2 00
Third, C. C. Shaw	1 00
Porter, George V. Fletcher	3 00
Second, C. M. Handley	2 00
Third, P. G. Hanson	1 00
Pound Sweet, George V. Fletcher	3 00
Second, George C. Rice	2 00
Third, Samuel Hartwell	1 00
Rhode Island Greening, Joshua C. Stone	4 00
Second, Elliott Moore	3 00
Third, George C. Rice	2 00

Roxbury Russet, Nathaniel T. Kidder	4 00
Second, J. A. Leonard	3 00
Third, E. R. Cook	2 00
Sutton, George Cruickshanks	3 00
Second, George C. Rice	2 00
Third, Henry E. Rich	1 00
Tolman's Sweet, Willard P. Plimpton	3 00
Second, George C. Rice	2 00
Third, C. C. Shaw	1 00
Tompkins King, George C. Rice	3 00
Second, F. J. Kinney	2 00
Third, John W. Clark	1 00
Washington Royal, or Palmer, O. B. Hadwen	3 00
Second, George Cruickshanks	2 00
Third, George C. Rice	1 00
Wealthy, C. M. Handley	3 00
Second, W. K. W. Hall	2 00
Third, George C. Rice	1 00
Any other variety, O. B. Hadwen, Bowen	3 00
Second, A. J. Moody	2 00
Third, John Parker	1 00
Crab Apples. — Hyslop, M. W. Chadbourne	2 00
Second, Norris R. Comley	1 00
Any other variety, S. Warren	2 00
Second, S. F. & F. L. Weston	1 00

Society's Prizes.

Pears. — Angouleme, A. T. Brown	4 00
Second, Samuel G. Damon	3 00
Third, Mrs. Emmons	2 00
Fourth, Warren Fenno	1 00
Bosc, Sumner Coolidge	4 00
Second, Warren Fenno	3 00
Third, A. T. Brown	2 00
Fourth, Arthur Coolidge	1 00
Clairgeau, William T. Hall	3 00
Second, Samuel G. Damon	2 00
Third, Warren Fenno	1 00
Comice, A. T. Brown	3 00
Second, Warren Fenno	2 00
Third, Leverett M. Chase	1 00
Dana's Hovey, A. T. Brown	4 00
Second, Samuel G. Damon	3 00
Third, Willard P. Plimpton	2 00
Fourth, Charles E. Swain	1 00
Diel, Charles E. Swain	3 00
Second, Benjamin G. Smith	2 00
Third, J. R. Magullion	1 00

Fulton, Elisha S. Converse	3 00
Second, John L. Bird	2 00
Hardy, Warren Fenno	3 00
Howell, Benjamin G. Smith	3 00
Second, Warren Fenno	2 00
Third, George F. Wheeler	1 00
Josephine of Malines, Warren Fenno	3 00
Second, John L. Bird	2 00
Third, L. W. Goodell	1 00
Lawrence, A. T. Brown	3 00
Second, Leverett M. Chase	2 00
Third, Warren Fenno	1 00
Louise Bonne of Jersey, Sumner Coolidge	3 00
Second, Warren Fenno	2 00
Third, Benjamin G. Smith	1 00
Marie Louise, Charles E. Swain	3 00
Second, Mr. Jones	2 00
Third, Warren Fenno	1 00
Merriam, Sumner Coolidge	3 00
Second, Samuel G. Damon	2 00
Third, A. T. Brown	1 00
Seckel, Charles F. Curtis	4 00
Second, Charles E. Swain	3 00
Third, A. T. Brown	2 00
Fourth, Mrs. S. Klaus	1 00
Sheldon, A. T. Brown	4 00
Second, Sumner Coolidge	3 00
Third, Samuel G. Damon	2 00
Fourth, William Milman	1 00
St. Michael Archangel, Warren Heustis & Son	3 00
Second, Benjamin G. Smith	2 00
Third, Warren Fenno	1 00
Superfin, Sumner Coolidge	3 00
Second, Warren Fenno	2 00
Urbaniste, A. T. Brown	3 00
Second, Charles E. Swain	2 00
Third, Mrs. Emmons	1 00
Vicar, A. T. Brown	3 00
Second, Mrs. Jones	2 00
Third, Sumner Coolidge	1 00
Winter Nelis, A. T. Brown	3 00
Second, Mrs. Emmons	2 00
Third, Clifford Weld	1 00
Any other variety, Charles B. Travis, Onondaga	3 00
Second, Warren Fenno, "	2 00
Third, John J. Merrill, "	1 00

Quinces. — Champion, Charles S. Smith	3 00
Second, Orlendo W. Dimick	2 00
Third, George V. Fletcher	1 00
Orange, J. E. Richardson	3 00
Second, George V. Fletcher	2 00
Third, Arthur F. Coolidge	1 00
Pear, E. R. Cook	3 00
Second, George V. Fletcher	2 00
Third, Benjamin G. Smith	1 00
Rea, Mrs. Mary T. Goddard	3 00
Second, George S. Curtis	2 00
Third, Benjamin G. Smith	1 00
Peaches, Orchard House Culture. — William C. Winter	4 00
Plums. — Yellow Egg, George V. Fletcher	2 00
Any other variety, Samuel G. Damon	2 00
Second, George V. Fletcher	1 00
Native Grapes. — Six bunches of Brighton, Samuel Hartwell	3 00
Second, Benjamin G. Smith	2 00
Third, M. W. Chadbourne	1 00
Delaware, Joseph S. Chase	4 00
Second, Samuel G. Damon	3 00
Third, Benjamin G. Smith	2 00
Fourth, Samuel Hartwell	1 00
Herbert, Samuel G. Damon	3 00
Second, Joseph S. Chase	2 00
Iona, Samuel G. Damon	3 00
Second, Joseph S. Chase	2 00
Third, Francis Blake	1 00
Lindley, Benjamin G. Smith	3 00
Second, Samuel G. Damon	2 00
Niagara, Oliver R. Robbins	3 00
Second, Samuel G. Damon	2 00
Third, Joseph S. Chase	1 00
Pocklington, Mrs. J. H. Jackman	4 00
Second, Samuel Hartwell	3 00
Third, P. G. Hanson	2 00
Fourth, S. F. & F. L. Weston	1 00
Prentiss, Benjamin G. Smith	3 00
Second, Joseph S. Chase	2 00
Wilder, Benjamin G. Smith	3 00
Second, Samuel G. Damon	2 00
Any other variety, Mrs. M. Haller, Salem	3 00
Second, Benjamin G. Smith, Merrimack	2 00
Third, F. J. Kinney, Salem	1 00
Concord from girdled vines, F. J. Kinney	3 00
Second, H. R. Kinney	2 00

Cranberries. — Half-peck, L. J. Fosdick	3 00
Second, L. J. Fosdick	2 00
Third, L. J. Fosdick	1 00
Gratuities: —	
Benjamin G. Smith, Display of Grapes	5 00
Warren Fenno, Collection	3 00

EXHIBITION OF WINTER FRUITS AND VEGETABLES.

November 21.

Benjamin V. French Fund.

Apples. — Baldwin, John W. Clark	5 00
Hubbardston, C. M. Handley	5 00

Society's Prizes.

Apples. — Baldwin, William Doran & Son	3 00
Second, J. V. Fletcher	2 00
Third, M. W. Chadbourne	1 00
Danvers Sweet, Warren Fenno	3 00
Second, C. M. Handley	2 00
Fletcher Russet, Charles F. Curtis	3 00
Second, George V. Fletcher	2 00
Third, William H. Teele	1 00
Hubbardston, Amos T. Leavitt	3 00
Second, C. M. Handley	2 00
Third, M. W. Chadbourne	1 00
Hunt Russet, Samuel Hartwell	3 00
Lady's Sweet, A. M. Knowlton	3 00
Northern Spy, George V. Fletcher	3 00
Second, Littlefield Farm	2 00
Third, William Doran & Son	1 00
Rhode Island Greening, George V. Fletcher	3 00
Second, J. W. Clark	2 00
Third, E. W. Wood	1 00
Roxbury Russet, George C. Rice	3 00
Second, George V. Fletcher	2 00
Third, Samuel Hartwell	1 00
Tolman's Sweet, Mrs. Sarah M. Moore	3 00
Second, George C. Rice	2 00
Third, Willard P. Plimpton	1 00
Tompkins King, George C. Rice	3 00
Second, Samuel Hartwell	2 00
Third, E. C. Stone	1 00

Any other variety, George C. Rice, Mackintosh	3 00
Second, George C. Rice, Yellow Bellflower	2 00
Third, George V. Fletcher, Pound Sweet	1 00
PEARS. — Angouleme, Samuel G. Damon	4 00
Second, A. T. Brown	3 00
Third, Mrs. Emmons	2 00
Fourth, Warren Fenno	1 00
Anjou, A. T. Brown	4 00
Second, Mrs. S. Klaus	3 00
Third, Charles E. Swain	2 00
Fourth, Samuel G. Damon	1 00
Clairgeau, William T. Hall	3 00
Second, Warren Fenno	2 00
Third, Samuel G. Damon	1 00
Comice, A. T. Brown	3 00
Dana's Hovey, A. T. Brown	4 00
Second, Samuel G. Damon	3 00
Third, Charles E. Swain	2 00
Fourth, Benjamin G. Smith	1 00
Diel, Charles E. Swain	3 00
Second, A. T. Brown	2 00
Third, Benjamin G. Smith	1 00
Glout Morceau, Warren Fenno	3 00
Second, Clifford Weld	2 00
Josephine of Malines, Warren Fenno	3 00
Second, John L. Bird	2 00
Langelier, A. T. Brown	3 00
Second, Mrs. S. Klaus	2 00
Third, T. M. Davis	1 00
Lawrence, A. T. Brown	3 00
Second, Warren Fenno	2 00
Third, Mrs. Emmons	1 00
Vicar, Mrs. Jones	3 00
Second, John J. Merrill	2 00
Third, A. T. Brown	1 00
Winter Nelis, A. T. Brown	3 00
Second, Mrs. Emmons	2 00
Third, Clifford Weld	1 00
Any other variety, Warren Fenno, Duchess of Bordeaux	3 00
Second, S. F. & F. L. Weston, Columbia	2 00
Third, Clifford Weld	1 00
Gratuities: —	
L. J. Fosdick, Cranberries	1 00
Rev. Calvin Terry, Cranberries	1 00

REPORT

OF THE

COMMITTEE ON VEGETABLES,

FOR THE YEAR 1896.

By CHARLES N. BRACKETT, Chairman.

The exhibition season for the year 1896 is just concluded, and a brief report of the doings of your Committee is now in order.

We are highly gratified to be able to report that our exhibitions in this department the past year have shown an onward movement, which testifies more plainly than any other evidence could do that the progress which is being made in vegetable culture is highly satisfactory. In each and every class the state of perfection in which the generality of exhibitors brought their various productions to the contest has been very good, and after making due allowance for the diversity of location and the effect upon some crops of the contingencies of the weather, we have seen quite enough to satisfy us that intelligent minds are engaged and careful hands are at work in growing the various products of the earth to that high degree of luxuriance and perfection which the judicious union of art in aid of nature's efforts can alone effect. Still, at none of our exhibitions has there been the least difficulty in detecting the marked difference between the well tended crop and its less fortunate competitor.

With a season favorable to vegetable growth, our weekly shows, from the first Saturday in July to the Annual Exhibition, have been unusually full and fine, and seemed to be thoroughly appreciated by the visiting public.

As usual, very good exhibits of forced vegetables were made

during the months of January and February. A. W. Crockford's Mushrooms, shown on several occasions during the winter, were remarkably fine and well grown specimens, deserving high commendation.

But few new vegetables were shown the past year requiring special mention. July 11 H. R. Kinney showed a new Pea under the name of Buck's New Life, a pea of the largest size, perfect in form and color, but lacking in quality. Of recent introduction, the Juno, a pea exhibited here last year for the first time, was shown July 25 by James Comley. While possessing all the points of the above mentioned variety, it can claim an additional and very important point; namely, quality. It is a pea of delicious flavor, and seemed to the Committee worthy of cultivation.

August 22 A. T. Brown exhibited a new and very large Tomato called Buckeye State. The specimens were well grown, but like most varieties of the largest size this will probably be found too late for profitable cultivation by the market gardener. On the same date a novelty in the way of a new Tomato with variegated foliage was shown by L. W. Goodell.

At this show the Boston Mycological Club made the largest display of the season, about 150 varieties of Fungi. Hollis Webster was the largest contributor, taking the first prize at this and subsequent prize days during the season. We note the continuance of the lively interest mentioned in last year's report in these exhibitions of our Native Mushrooms, both by members and visitors.

Your Committee are of the opinion that prizes should be offered for only known, named, edible varieties, and that such exhibits should be shown separately, and not mixed up on the same table with poisonous or doubtful varieties. Shown in this manner, they would become object lessons to the student of this subject, who would soon learn to know them at sight.

At a recent meeting of the Society the following vote was passed with reference to these exhibits in future, to which the attention of those interested is called:

"Voted, That the Vegetable Committee be requested to provide cards distinctively colored (red or otherwise), and having the word 'Poisonous' plainly printed thereon, and that exhibitors of Fungi not known to be edible be required to use these cards in labelling all such exhibits when shown in Horticultural Hall."

September 12, the last of the weekly exhibitions, was as usual the largest and one of the best of the season. Nearly all the prizes were competed for and awarded.

The display of Potatoes at the Annual Exhibition formed as usual one of the most interesting features of this show, the variety being great (ninety-five dishes were shown) and the quality unsurpassed. C. H. Thomas again took the first prize for the best four varieties. Celery, Cauliflowers, Tomatoes, Squashes, Egg Plants, etc., were also most richly represented.

The various root crops are deserving of special mention, for we have never seen finer or more perfect specimens of the different varieties of Beets, Carrots, Parsnips, and Turnips than were shown at this exhibition. We are pleased to bear testimony to H. R. Kinney's skill as a grower of fine vegetables, as manifested in the very fine specimens which on several occasions gained for him the first premium. He also secured the first prize at this exhibition for the best collection of vegetables arranged for effect.

The display of Tomatoes, consisting of sixty dishes, mainly of standard kinds, was, owing to the lateness of the season, not equal to that made on September 12. The first prize for the best three varieties was awarded to E. C. Lewis. Hon. Aaron Low was the largest contributor, showing some twenty or more varieties.

Competition for prizes the past year has been unusually close and spirited, and the Committee in making the awards have seldom had their powers of discrimination so thoroughly tested.

The amount appropriated for the year 1896 was . .	$1,150 00
The Committee have awarded in prizes and gratuities .	1,107 00
Leaving an unexpended balance of	$43 00

All of which is respectfully submitted.

For the Committee,

C. N. Brackett, *Chairman.*

PRIZES AND GRATUITIES AWARDED FOR VEGETABLES.

1896.

January 11.

Radishes. — Four bunches of any variety, Arthur F. Coolidge	$3 00
Cucumbers. — Pair of any variety, Francis Blake	3 00
Second, Arthur F. Coolidge	2 00
Third, Francis Blake	1 00
Cauliflowers. — Four specimens, William H. Teele	3 00
Lettuce. — Four heads of Tennisball, Joshua C. Stone	3 00
Second, Arthur F. Coolidge	2 00
Third, H. R. Kinney	1 00
Parsley. — Two quarts, David Nevins	2 00
Second, W. N. Craig	1 00
Mushrooms. — Twenty-four specimens, A. W. Crockford	3 00
Second, Elisha S. Converse	2 00
Tomatoes. — Twelve specimens, William C. Winter, Chemin	3 00
Second, W. N. Craig, May's Favorite	2 00
Third, William C. Winter, Essex	1 00

Gratuities : —

Warren Heustis & Son, Celery	1 00
A. W. Crockford, Mushrooms	1 00

February 1.

Radishes. — Four bunches of any variety, Joshua C. Stone	2 00
Cucumbers. — Pair of any variety, Francis Blake	3 00
Dandelions. — Peck, David Nevins	3 00
Second, William C. Winter	2 00
Lettuce. — Four heads of Tennisball, Joshua C. Stone	3 00
Mushrooms. — Twenty-four specimens, A. W. Crockford	3 00
Rhubarb. — Twelve stalks, C. F. Smith	3 00
Second, George Sanderson	2 00
Third, Norris R. Comley	1 00
Tomatoes. — Twelve specimens, Francis Blake	3 00
Second, William C. Winter, President Cleveland	2 00
Third, William C. Winter, Chemin	1 00

Gratuity : —

Norris R Comley, Rhubarb	1 00

February 8.

Gratuities : —

M. Ernest Moore, Lettuce 1 00
Norris R. Comley, Rhubarb 1 00
George Seaverns, Tomatoes 1 00

February 15.

Gratuity : —

Norris R. Comley, Rhubarb 1 00

February 29.

Gratuities : —

Warren Heustis & Son, Dandelions 1 00
Rev. Calvin Terry, Canada Squashes 1 00

SPRING EXHIBITION.

March 24, 25, 26, and 27.

Radishes. — Four bunches of Turnip Rooted, Joshua C. Stone . 2 00
Second, A. W. Crockford 1 00
Cucumbers. — Pair of White Spine, M. D. Hawes 3 00
Second, M. Ernest Moore 2 00
Third, Francis Blake 1 00
Dandelions. — Peck, Warren Heustis & Son 3 00
Second, Arthur F. Coolidge 2 00
Third, Hon. Aaron Low 1 00
Lettuce. — Four heads of Tennisball, John L. Gardner . . . 3 00
Second, Arthur F. Coolidge 2 00
Third, Joshua C. Stone 1 00
Water Cress. — Two quarts, Benjamin P. Ware 2 00
Parsley. — Two quarts, David Nevins 2 00
Second, Arthur F. Coolidge 1 00
Mushrooms. — Twenty-four specimens, A. W. Crockford . . 3 00
Rhubarb. — Twelve stalks, the second prize to George Sanderson . 2 00
Tomatoes. — Twelve specimens, Francis Blake, Essex . . . 3 00
Second, Francis Blake, Nicholson 2 00
Third, William Nicholson, Nicholson 1 00

Gratuities : —

Ettore Tassinari, Onions 1 00
Rev. Calvin Terry, Potatoes 1 00
M. W. Chadbourne, Artichokes 1 00
Warren Heustis & Son, Dandelions 1 00
Arthur F. Coolidge, Collection 1 00

April 4.

Cucumbers. — Pair of White Spine, M. Ernest Moore	3 00
Second, Francis Blake	2 00
Third, James Comley	1 00
Gratuities: —	
Hon. Aaron Low, twenty varieties of Potatoes	3 00
M. Ernest Moore, Lettuce	1 00
Warren Heustis & Son, Beet Greens	1 00

April 11.

Gratuities: —	
William Nicholson, Tomatoes	1 00
Warren Heustis & Son, Dandelions	1 00
James Comley, Cucumbers	1 00

April 17.

Gratuities: —	
James Comley, Cucumbers	1 00
Warren Heustis & Son, Dandelions	1 00

MAY EXHIBITION.

May 2.

Asparagus. — Four bunches, twelve stalks each, L. W. Weston	3 00
Second, Hon. George Heywood	2 00
Cucumbers. — Pair of White Spine, M. Ernest Moore	3 00
Second, M. D. Hawes	2 00
Third, Arthur F. Coolidge	1 00
Spinach. — Peck, Arthur F. Coolidge	3 00
Dandelions. — Peck, M. Ernest Moore	2 00
Second, Hon. Aaron Low	1 00
Lettuce. — Four heads, M. E. Moore	3 00
Second, Arthur F. Coolidge	2 00
Rhubarb. — Twelve stalks, P. G. Hanson	2 00
Second, George Sanderson	1 00
Gratuities: —	
W. N. Craig, Collection	3 00
William Nicholson, Tomatoes	1 00

May 9.

Gratuities: —	
Hon. George Heywood, Asparagus	1 00
L. W. Weston, Asparagus	1 00
P. G. Hanson, Collection	2 00
Warren Heustis & Son, Collection	1 00

May 16.

Gratuities : —

P. G. Hanson, Asparagus and Rhubarb	2 00
Mrs. Mary T. Goddard, Cauliflowers	2 00
Hon. George Heywood, Asparagus	1 00
L. W. Weston, Asparagus	1 00
Warren Heustis & Son, Lettuce	1 00

May 23.

Gratuities : —

Hon. George Heywood, Asparagus	2 00
P. G. Hanson, Asparagus	1 00
Warren Heustis & Son, Lettuce and Radishes	1 00

RHODODENDRON SHOW.

June 4 and 5.

Theodore Lyman Fund.

Beets. — Twelve specimens, any variety, John J. Lyon	3 00
Second, Arthur F. Coolidge	2 00
Third, Mrs. M. T. Goddard	1 00
Carrots. — Twelve Short Scarlet, W. N. Craig	3 00
Second, Mrs. Mary T. Goddard	2 00
Radishes. — Four bunches of Turnip Rooted, George D. Moore	2 00
Second, H. R. Kinney	1 00
Four bunches of Long Scarlet, George D. Moore	2 00
Second, H. R. Kinney	1 00
Asparagus. — Four bunches, twelve stalks each, P. G. Hanson	3 00
Second, William H. Hunt	2 00
Third, Hon. George Heywood	1 00
Cucumbers. — Pair, Francis-Blake	3 00
Second, H. R. Kinney	2 00
Third, George D. Moore	1 00
Lettuce. — Four heads, Warren Heustis & Son	3 00
Second, George D. Moore	2 00
Third, Arthur F. Coolidge	1 00
Rhubarb. — Twelve stalks, Warren Heustis & Son	3 00
Second, P. G. Hanson	2 00
Third, Arthur F. Coolidge	1 00
Mushrooms. — Twenty-four specimens, H. R. Kinney	3 00
Tomatoes. — Twelve specimens, William C. Winter, President Cleveland	3 00
Second, W. N. Craig, May's Favorite	2 00
Third, W. N. Craig, Eclipse	1 00

Gratuities : —

Hon. Joseph S. Fay, Cauliflowers	1 00
Hon. Joseph S. Fay, Lettuce	1 00
P. G. Hanson, Rhubarb	1 00
Mrs. Mary T. Goddard, Cauliflowers	1 00
Warren Heustis & Son, Collection	2 00
Arthur F. Coolidge, "	1 00
George D. Moore, "	1 00

JUNE 13.

Gratuities : —

Hon. George Heywood, Asparagus	1 00
Norris R. Comley, Cucumbers	1 00
Warren Heustis & Son, Rhubarb	1 00
Hon. Joseph S. Fay, Collection	3 00

JUNE 20.

Gratuities : —

Hon. Joseph S. Fay, Cauliflowers and Lettuce	2 00
Warren Heustis & Son, Collection	2 00

ROSE AND STRAWBERRY SHOW.

JUNE 23 AND 24.

BEETS. — Twelve Summer Turnip Rooted, Sumner Coolidge	3 00
Second, Warren Heustis & Son	2 00
Third, Arthur F. Coolidge	1 00
ONIONS. — Twelve specimens, Warren Heustis & Son	3 00
Second, Sumner Coolidge	2 00
Third, Samuel J. Trepess	1 00
CUCUMBERS. — Pair of White Spine, Warren Heustis & Son	3 00
Second, Arthur F. Coolidge	2 00
Third, Joshua C. Stone	1 00
CABBAGES. — Three of any variety, Warren Heustis & Son, All Seasons	3 00
Second, Hon. Joseph S. Fay	2 00
Third, Warren Heustis & Son, Succession	1 00
LETTUCE. — Four heads of any variety, Arthur F. Coolidge	2 00
Second, Sumner Coolidge	1 00
PEAS. — Half-peck of any variety, Hon. Joseph S. Fay, American Wonder	3 00
Second, Elliott Moore, Notts Excelsior	2 00
Third, George V. Fletcher, American Wonder	1 00

Gratuities : —

James Comley, Potatoes 1 00
William C. Winter, Tomatoes 1 00
M. T. Stevens, Tomatoes 1 00
Warren Heustis & Son, Collection 2 00

JUNE 27.

POTATOES. — Twelve specimens, C. W. Hubbard 3 00
Second, James Comley 2 00
ONIONS. — Twelve specimens, Warren Heustis & Son . . . 2 00
Second, George D. Moore 1 00
SQUASHES. — Four Long Warted, Joshua C. Stone 2 00
Second, Arthur F. Coolidge 1 00
Four Scalloped, Sumner Coolidge 2 00
Second, Arthur F. Coolidge 1 00
CABBAGES. — Three of any variety, trimmed, George D. Moore . 3 00
Second, Warren Heustis & Son, All Seasons 2 00
Third, Warren Heustis & Son, Wakefield 1 00
BEANS. — Half-peck of String, any variety, Arthur F. Coolidge . 3 00
Second, Joshua C. Stone 2 00
Third, Sumner Coolidge 1 00
PEAS. — Half-peck of American Wonder, Hon. Joseph S. Fay . 3 00
Second, Isaac E. Coburn 2 00

Gratuities : —

Warren Heustis & Son, Collection 2 00
George D. Moore, " 2 00

JULY 11.

Levi Whitcomb Fund.

CABBAGES. — Three Drumhead, trimmed, George D. Moore . . 3 00
Second, Warren Heustis & Son 2 00
BEANS. — Half-peck of Cranberry, Samuel Hartwell . . . 3 00
Second, Joshua C. Stone 2 00
Third, George D. Moore 1 00
PEAS. — Half-peck of any variety, George V. Fletcher, Stratagem . 3 00
Second, Isaac E. Coburn, Advancer 2 00
Third, George V. Fletcher, Advancer 1 00
SWEET CORN. — Twelve ears, Sumner Coolidge 3 00
Second, Joshua C. Stone 2 00
TOMATOES. — Open culture, twelve specimens, E. N. Pierce, Stone, 3 00
Second, Isaac E. Coburn, Comrade 2 00
Third, Samuel J. Trepess, Faultless 1 00

Gratuities : —

Nathaniel T. Kidder, Tomatoes 1 00
H. R. Kinney, New Pea, Buck's New Life 1 00
H. R. Kinney, Stratagem Peas 1 00
Warren Heustis & Son, Collection 2 00
George D. Moore, Collection 1 00

JULY 18.

POTATOES. — Twelve specimens, Hon. Joseph S. Fay, Hebron . 3 00
Second, Hon. Joseph S. Fay, Rose 2 00
Third, Isaac E. Coburn, Rose 1 00
LETTUCE. — Four heads of any variety, Warren Heustis & Son . 2 00
Second, John Jeffries 1 00
SWEET CORN. — Twelve ears, Sumner Coolidge, Hybrid . . . 3 00
Second, Francis Blake, Crosby 2 00
Third, Sumner Coolidge, Corey 1 00
TOMATOES. — Open culture, twelve specimens, Isaac E. Coburn . 3 00
Second, Samuel J. Trepess, May's Favorite 2 00
Third, Samuel J. Trepess, Faultless 1 00

JULY 18.

Gratuities : —

Hon. Aaron Low, Collection of Beans 2 00
Isaac E. Coburn, Peas 1 00
Rev. Calvin Terry, Peas and Beans 1 00
Warren Heustis & Son, Collection 2 00

JULY 25.

POTATOES. — Any variety, twelve specimens, Isaac E. Coburn, Clark 3 00
Second, Benjamin P. Ware, Roberts's Early 2 00
Third, James Comley, Early Harvest 1 00
SQUASHES. — Three Marrow, Sumner Coolidge 3 00
PEAS. — Half-peck of any variety, Hon. Aaron Low, Stratagem . 3 00
Second, James Comley, Juno 2 00
Third, Isaac E. Coburn, Heroine 1 00
SWEET CORN. — Twelve ears of Crosby, Sumner Coolidge . . 3 00
Second, Francis Blake 2 00
Twelve ears of any other variety, Sumner Coolidge, Hybrid . 3 00
TOMATOES. — Twelve specimens, Samuel J. Trepess, May's Favorite 3 00
Second, Samuel J. Trepess, Stone 2 00
Third, Samuel J. Trepess, Faultless 1 00
NATIVE MUSHROOMS. — Named collection, edible and poisonous varieties to be shown separately, and to be so designated, Hollis Webster 5 00
Third, William W. Burlen 3 00

Gratuities : —

Hon. Aaron Low, Tomatoes	1 00
David Fisk, Horticultural Beans	1 00
James Comley, Collection	3 00
John Jeffries, "	1 00

August 1.

Beans. — Two quarts of Goddard, shelled, Warren Heustis & Son	3 00
Second, Samuel Hartwell	2 00
Third, Rev. Calvin Terry	1 00
Half-peck of Horticultural, Isaac E. Coburn	3 00
Second, Sumner Coolidge	2 00
Third, Joshua C. Stone	1 00
Tomatoes. — Twelve specimens of Comrade, Isaac E. Coburn	3 00
Second, Hon. Aaron Low	2 00
Twelve specimens of Stone, Joshua C. Stone	3 00
Twelve specimens of any other variety, Samuel J. Trepess, May's Favorite	3 00
Egg Plant. — Four specimens of Round Purple, Arthur F. Coolidge	3 00
Second, Sumner Coolidge	2 00

Gratuities : —

Dr. George E. Francis, Twenty-six varieties of Mushrooms	2 00
Alexander L. Hayes, Mushrooms	1 00
Arthur F. Coolidge, Celery	1 00
Hon. Aaron Low, Collection	2 00
Warren Heustis & Son, Collection	1 00

August 8.

Greenflesh Melons. — Four specimens, Arthur F. Coolidge	3 00
Second, Joshua C. Stone	2 00
Salmon Flesh Melons. — Four specimens, Joshua C. Stone	3 00
Sweet Corn. — Twelve ears, Rev. Calvin Terry	3 00
Second, Sumner Coolidge	2 00
Third, Oliver R. Robbins	1 00
Egg Plant. — Four specimens of Round Purple, Arthur F. Coolidge	2 00
Second, Joshua C. Stone	1 00

Gratuities : —

Boston Mycological Club, Fungi	2 00
Samuel Hartwell, Collection	1 00
Hon. Aaron Low, "	1 00

August 15.

Potatoes. — Twelve specimens of any variety, Samuel Hartwell, Rose 3 00
Second, Isaac E. Coburn, Hebron 2 00
Third, Samuel Hartwell, Hebron 1 00
Onions. — Twelve specimens, Sumner Coolidge 3 00
Second, Benjamin P. Ware, Cracker 2 00
Third, Benjamin P. Ware, Silver Skin 1 00
Greenflesh Melons. — Four specimens, Arthur F. Coolidge . 3 00
Second, Joshua C. Stone 2 00
Salmon Flesh Melons. — Any variety, four specimens, Joshua C. Stone 3 00
Second, Frank M. Stone 2 00
Celery. — Four roots of any variety, Arthur F. Coolidge, Paris Golden 3 00
Second, Warren Heustis & Son, Paris Golden 2 00
Third, Arthur F. Coolidge, Pascal 1 00
Beans. — Two quarts of Large Lima, Sumner Coolidge . . . 3 00
Two quarts of Goddard, shelled, Benjamin P. Ware . . . 3 00
Second, Isaac E. Coburn 2 00
Third, Warren Heustis & Son 1 00
Sweet Corn. — Twelve ears of Potter's Excelsior, Isaac E. Coburn 3 00
Second, Hon. Aaron Low 2 00
Third, Rev. Calvin Terry 1 00
Twelve ears of any other variety, P. G. Hanson, Quincy Market, 3 00
Second, E. C. Lewis, Quincy Market 2 00
Third, Hon. Aaron Low, Melrose 1 00
Peppers. — Twelve specimens of Squash, George Lincoln . . 3 00
Second, Arthur F. Coolidge 2 00
Third, P. G. Hanson 1 00
Any other variety, E. C. Lewis, Ruby King 3 00

Gratuities: —
James Comley, Collection 3 00
E. C. Lewis, " 3 00
Hon. Aaron Low, " 1 00
Warren Heustis & Son, Collection 1 00
William C. Bates, Mushrooms 1 00
Henry F. Kellogg, " 1 00

August 22.

Greenflesh Melons. — Four specimens, Joshua C. Stone . . 3 00
Second, Arthur F. Coolidge 2 00
Third, Isaac E. Coburn 1 00

Salmon Flesh Melons. — Four specimens, Joshua C. Stone . 3 00
Second, Frank M. Stone 2 00
Watermelons. — Pair, Joshua C. Stone 3 00
Cabbages. — Three of any variety, trimmed, Arthur F. Coolidge . 3 00
Celery. — Four roots, Arthur F. Coolidge, Paris Golden . . 3 00
Second, Arthur F. Coolidge, Pascal 2 00
Third, Warren Heustis & Son, Paris Golden 1 00
Beans. — Two quarts of Large Lima, Sumner Coolidge . . . 3 00
Two quarts of Dwarf Lima, Isaac E. Coburn 3 00
Martynias. — Twelve specimens, M. W. Chadbourne . . . 2 00
Second, Samuel J. Trepess 1 00
Native Mushrooms. — Named collection, edible and poisonous varieties to be shown separately, and to be so designated, Hollis Webster 5 00
Second, Dr. George E. Francis 4 00
Third, J. C. Young 3 00

Gratuities: —

A. T. Brown, Tomatoes 1 00
Warren Heustis & Son, Celery 1 00
Hon. Aaron Low, Collection 2 00
Samuel Hartwell, " 1 00
P. G. Hanson, " 1 00
Mrs. E. M. Gill, " 1 00

September 12.

Turnips. — Twelve Flat, H. R. Kinney 3 00
Second, John Jeffries 2 00
Greenflesh Melons. — Four specimens, E. C. Lewis . . . 3 00
Second, Sumner Coolidge 2 00
Third, Samuel Hartwell 1 00
Salmon Flesh Melons. — Four specimens, Joshua C. Stone . 3 00
Watermelons. — Two specimens, Joshua C. Stone . . . 3 00
Cauliflowers. — Four specimens, William H. Teele . . . 3 00
Lettuce. — Four heads of any variety, H. R. Kinney . . . 3 00
Second, Sumner Coolidge 2 00
Third, George E. Sanderson 1 00
Celery. — Four roots of any variety, Arthur F. Coolidge . . 3 00
Second, Warren Heustis & Son, Pascal 2 00
Third, Warren Heustis & Son, Paris Golden 1 00
Parsley. — Two quarts, Sumner Coolidge 2 00
Second, Arthur F. Coolidge 1 00
Beans. — Large Lima, two quarts, Sumner Coolidge . . . 3 00
Second, E. C. Lewis 2 00
Third, Mrs. Mary T. Goddard 1 00

Corn. — Sweet, twelve ears of Potter's Excelsior, Isaac E. Coburn	3 00
Second, Hon. Aaron Low	2 00
Third, Rev. Calvin Terry	1 00
Any other sweet variety, P. G. Hanson, Crosby	3 00
Second, P. G. Hanson, Quincy Market	2 00
Third, Rev. Calvin Terry, Crosby	1 00
Egg Plants. — Four Round Purple, H. R. Kinney	3 00
Second, Arthur F. Coolidge	2 00
Third, Sumner Coolidge	1 00
Tomatoes. — Three varieties, twelve specimens each, Hon. Aaron Low, Paragon, Perfection, Acme	5 00
Second, Hon. Aaron Low, Essex, Ignotum, Imperial	4 00
Third, David L. Fisk	3 00
Twelve Comrade, David L. Fisk	3 00
Second, Hon. Aaron Low	2 00
Third, Isaac E. Coburn	1 00
Twelve May's Favorite, Hon. Aaron Low	3 00
Second, Samuel J. Trepess	2 00
Third, Isaac E. Coburn	1 00
Twelve Stone, Hon. Aaron Low	3 00
Second, P. G. Hanson	2 00
Third, Sumner Coolidge	1 00
Twelve of any other variety, David L. Fisk, Beauty	3 00
Second, Arthur F. Coolidge	2 00
Third, Isaac E. Coburn	1 00
Martynias. — Twelve specimens, Hon. Aaron Low	2 00
Second, Samuel J. Trepess	1 00
Okra. — Twelve specimens, E. C. Lewis	2 00
Second, E. C. Lewis, Dwarf	1 00
Peppers. — Twelve specimens of Squash, Hon. Aaron Low	2 00
Second, George W. Jameson	1 00
Any other variety, Hon. Aaron Low, Ruby King	2 00
Second, E. C. Lewis, Ruby King	1 00
Native Mushrooms. — Named collection, edible and poisonous varieties to be shown separately, and to be so designated, Hollis Webster	5 00
Second, Ellen W. Rumrill	4 00
Third, A. P. Doughty	3 00
Gratuities: —	
Hon. Aaron Low, Collection of Tomatoes	5 00
E. C. Lewis, Collection	5 00
Warren Heustis & Son, "	2 00
Arthur F. Coolidge, "	3 00
P. G. Hanson, "	1 00

September 26.

Gratuity: —	
Warren Heustis & Son, Celery	1 00

ANNUAL EXHIBITION OF FRUITS AND VEGETABLES.

October 1 and 2.

Regular Prizes.

Beets. — Twelve Turnip Rooted, C. H. Thomas	3 00
Second, Joshua C. Stone	2 00
Third, Warren Heustis & Son	1 00
Carrots. — Twelve Long Orange, H. R. Kinney	3 00
Second, E. C. Lewis	2 00
Third, Samuel J. Trepess	1 00
Twelve Intermediate, H. R. Kinney	3 00
Second, E. C. Lewis	2 00
Third, Mrs. Mary T. Goddard	1 00
Parsnips. — Four varieties, twelve specimens each, H. R. Kinney	3 00
Second, Warren Heustis & Son	2 00
Third, George D. Moore	1 00
Potatoes. — Four varieties, twelve specimens each, C. H. Thomas,	5 00
Second, Isaac E. Coburn	4 00
Third, Mrs. Mary T. Goddard	3 00
Twelve Clark, Isaac E. Coburn	3 00
Second, Mrs. Mary T. Goddard	2 00
Third, C. H. Thomas	1 00
Twelve Hebron, F. J. Kinney	3 00
Second, Isaac E. Coburn	2 00
Third, H. R. Kinney	1 00
Twelve Rose, Isaac E. Coburn	3 00
Second, H. R. Kinney	2 00
Third, C. H. Thomas	1 00
Twelve Savoy, Isaac E. Coburn	3 00
Second, H. R. Kinney	2 00
Third, Mrs. Mary T. Goddard	1 00
Twelve of any other variety, C. H. Thomas, Carman No. 3	3 00
Second, H. R. Kinney, Carman No. 1	2 00
Third, Mrs. Mary T. Goddard, Notts Victor	1 00
Salsify. — Twelve specimens, George D. Moore	3 00
Second, H. R. Kinney	2 00
Third, Warren Heustis & Son	1 00
Turnips. — Twelve Flat, F. J. Kinney	2 00
Second, Mrs. Mary T. Goddard	1 00
Twelve Swedish, Henry E. Rich, White	2 00
Second, Henry E. Rich, Skirving's Purple	1 00
Onions. — Twelve Danvers, Samuel J. Trepess	3 00
Second, George D. Moore	2 00
Third, Hon. J. J. H. Gregory	1 00

Twelve Red, Hon. J. J. H. Gregory	3 00
Second, W. N. Craig	2 00
Squashes. — Three Bay State, Hon. Aaron Low	3 00
Second, Arthur F. Coolidge	2 00
Third, Warren Heustis & Son	1 00
Three Hubbard, Samuel Hartwell	3 00
Second, Joshua C. Stone	2 00
Third, Arthur F. Coolidge	1 00
Three Hybrid Turban, Hon. Aaron Low	3 00
Second, E. C. Lewis	2 00
Third, Arthur F. Coolidge	1 00
Three Marblehead, E. C. Lewis	3 00
Second, Joshua C. Stone	2 00
Three Marrow, Warren Heustis & Son	3 00
Second, Arthur F. Coolidge	2 00
Third, Sumner Coolidge	1 00
Brussels Sprouts. — Half-peck, John Jeffries	3 00
Second, Nathaniel T. Kidder	2 00
Third, Hon. Aaron Low	1 00
Cabbages. — Three Drumhead, trimmed, Samuel Hartwell	3 00
Second, Oliver R. Robbins	2 00
Third, B. J. De Souza	1 00
Three Red, trimmed, Hon. Aaron Low	3 00
Second, H. R. Kinney	2 00
Third, E. C. Lewis	1 00
Three Savoy, trimmed, Samuel Hartwell	3 00
Second, H. R. Kinney	2 00
Third, E. C. Lewis	1 00
Cauliflowers. — Four specimens, A. M. Knowlton	5 00
Second, William H. Teele	4 00
Third, B. J. De Souza	3 00
Fourth, Henry E. Rich	2 00
Celery. — Best kept during the exhibition, four roots of Paris Golden, Arthur F. Coolidge	5 00
Second, Warren Heustis & Son	4 00
Third, H. R. Kinney	3 00
Any other variety, Warren Heustis & Son, Pascal	5 00
Second, A. Nixon, White Plume	4 00
Third, H. R. Kinney, Pascal	3 00
Endive. — Four specimens, E. C. Lewis	3 00
Second, H. R. Kinney	2 00
Third, Mrs. M. Haller	1 00
Lettuce. — Four heads, Calvin A. Hoar	3 00
Second, Sumner Coolidge	2 00
Third, Warren Heustis & Son	1 00
Parsley. — Two quarts, Sumner Coolidge	2 00
Second, Arthur F. Coolidge	1 00

Horseradish. — Six Roots, H. R. Kinney	2 00
Second, George D. Moore	1 00
Corn. — Yellow or Field, twenty-five ears, Elliott Moore	3 00
Second, Henry E. Rich, Twelve Rowed	2 00
Third, Henry E. Rich, Eight Rowed	1 00
Egg Plant. — Four Round Purple, Sumner Coolidge	3 00
Second, Arthur F. Coolidge	2 00
Third, George D. Moore	1 00
Tomatoes. — Three varieties, twelve specimens each, E. C. Lewis,	5 00
Second, Hon. Aaron Low, Perfection, Stone, and Cardinal	4 00
Third, Hon. Aaron Low, May's Favorite, Scoville, and Paragon	3 00
Twelve Comrade, Hon. Aaron Low	3 00
Twelve May's Favorite, Isaac E. Coburn	3 00
Second, W. N. Craig	2 00
Twelve Stone, Daniel L. Fisk	3 00
Second, Hon. Aaron Low	2 00
Third, Joseph Thorp	1 00
Twelve of any other variety, Arthur F. Coolidge, Puritan	3 00
Second, Isaac E. Coburn, Ignotum	2 00
Third, Hon. Aaron Low, G. A. R.	1 00
Peppers. — Twelve specimens of Squash, George W. Jameson	3 00
Second, George Lincoln	2 00
Third, Arthur F. Coolidge	1 00
Any other variety, Hon. Aaron Low, Bull Nose	3 00
Second, Hon. Aaron Low, Ruby King	2 00
Third, Hon. Aaron Low, Golden Queen	1 00
Culinary Herbs. — Collection, named, W. N. Craig	5 00
Collection of Vegetables, covering fifty square feet, arranged for effect, H. R. Kinney	15 00
Second, Warren Heustis & Son	12 00
Third, Arthur F. Coolidge	10 00
Fourth, E. C. Lewis	8 00

Gratuities : —

Hon. Aaron Low, Collection of Tomatoes	3 00
Joshua C. Stone, Watermelons	1 00
W. N. Craig, Collection	4 00
John Jeffries, "	2 00
Warren Heustis & Son, "	2 00
P. G. Hanson, "	2 00
A. A. Lawrence, "	2 00
George D. Moore, "	1 00
Mrs. Mary T. Goddard, "	1 00

October 10.

Gratuity : —

Warren Heustis & Son, Celery	1 00

October 17.

Gratuity : —

Warren Heustis & Son, Celery 1 00

October 24.

Gratuities : —

William C. Winter, Tomatoes 1 00
Warren Heustis & Son, Celery 1 00

October 31.

Gratuity : —

Warren Heustis & Son, Celery 1 00

EXHIBITION OF WINTER FRUITS AND VEGETABLES.

November 21.

Cucumbers. — Pair, Francis Blake 3 00
Second, John L. Gardner 2 00
Cabbages. — Three Red, trimmed, Hon. Aaron Low . . . 3 00
Second, Samuel Hartwell 2 00
Three Savoy, trimmed, Joshua C. Stone 3 00
Second, Warren Heustis & Son 2 00
Third, Samuel Hartwell 1 00
Brussels Sprouts. — Half-peck, John Jeffries 3 00
Second, John L. Gardner 2 00
Third, Hon. Aaron Low 1 00
Cauliflowers. — Four specimens, A. M. Knowlton . . . 3 00
Second, William H. Teele 2 00
Third, B. J. De Souza 1 00
Celery. — Four roots, Warren Heustis & Son, Pascal . . . 3 00
Second, Warren Heustis & Son, Paris Golden 2 00
Third, Warren Heustis & Son, Boston Market 1 00
Lettuce. — Four heads, Joshua C. Stone 3 00
Second, George D. Moore 2 00
Third, Warren Heustis & Son 1 00
Tomatoes. — Twelve specimens, grown under glass, William C. Winter, Stone 3 00
Second, William C. Winter, Perfection 2 00
Third, Francis Blake 1 00

Gratuities : —

Warren Heustis & Son, Collection 3 00
Elisha S. Converse, Mushrooms 1 00

December 5.

Gratuities : —

Warren Heustis & Son, Lettuce 1 00
Hon. Aaron Low, Spinach and Brussels Sprouts 1 00

REPORT

OF THE

COMMITTEE ON GARDENS,

FOR THE YEAR 1896.

By JOHN G. BARKER, Chairman.

The Committee take pleasure in reporting to the Society a season of unusual activity and interest, the prizes offered having been competed for more than in any previous season. In all, we have made eleven visits, and on each occasion the subjects for competition were of unusual merit, and we feel that the purpose for which the Committee is established has been more satisfactorily carried out than in previous seasons. We are glad to report that Mr. David Nevins has entered his fine estate at Framingham for the H. H. Hunnewell Triennial Premium, and that Mrs. Benjamin P. Cheney has also entered her estate at South Natick for the same Premium. We expect to make the first visit at Mrs. Cheney's place in June, 1897.

Your attention is invited to the statements of the various competitors, which are of practical value.

David Nevins's Estate, Framingham.

The Committee have made two visits to the fine estate of Mr. David Nevins, at Framingham. The large extent of the estate and the varied fine views lend to it a charm and attraction not easily described. To appreciate its beauty it must be seen; there is no spot anywhere that has not some attraction. As we enter the estate from Framingham, a portion on the borders of Farm Pond

is laid out with well-planned drives. Here no attempt has been made at artificial treatment, but the native trees have been well cared for, and the grounds kept clean, and with the exception of a few evergreens that have been planted there, it is as near a natural park as can well be. It is a pleasant spot of about 150 acres, and is a fine example of what can be done with a natural piece of woodland where a small amount is laid out to make it accessible for pedestrians and carriage driving. We believe this is open to the public, who enjoy it at their will. Leaving this place, we approach the estate proper, which is reached by a driveway, the borders of which are planted with groups and single specimens of evergreens in well selected varieties. After crossing the county road we enter that part of the estate occupied by the mansion-house, gardens, farm barn, and stables. We find the kitchen-garden well arranged, with a good variety of vegetables and small fruits, all in the highest state of cultivation. There is a small amount of glass structures and cold frames, which are invaluable on an estate of this size. After a highly satisfactory inspection of this department, we retrace our steps to the long drive leading to the mansion-house. Between this drive and the county road there is no fence, but an irregular border of shrubs and evergreen trees of many interesting varieties planted in groups. On the left a large planting of shrubs, in variety, divides the lawn from the meadow, two hundred or more feet from the house, which stands on the highest elevation of the estate. On the east side a large parterre is laid out between the mansion-house and a stone wall not far from the highway, the border in front of the wall being planted with low-growing evergreens. The arrangement of the parterre gives a pleasing approach to the house. On the opposite side of the house the grass grade slopes gradually to the Sudbury River. The stable, at a convenient distance from the house, is hidden by a belt of trees in a very healthy condition. A continuation of the drive to the westerly end of the estate takes us where the extended views are the charm and admiration of all. They are certainly not excelled in New England, and it is doubtful whether they are in old England. In the distance Mount Wachusett is plainly visible, and the beauty and variety of hill and dale with the fine water front can hardly be excelled. We are again attracted by the excellent specimens of evergreens in the border between the estate and the

highway. Particularly noticeable are elegant specimens of *Abies concolor*, *A. Douglasii*, *A. orientalis*, *A. Nordmanniana*, and *Picea pungens* of good form and rich coloring. A commendable feature, especially in the case of the trees, is that they have not been allowed to grow so closely together as to spoil each other, but much time and labor are bestowed every year in pruning and thinning out the trees and shrubs. Every effort is made to grow good specimens of the rarer and choicer varieties of evergreens, which in the near future will be a splendid feature of the place. Perhaps the most enjoyable spot is the piazza of the house, where the most varied and extended views are obtained. In the distance, looking in one direction, we see a train of cars wending its way through meadow and woods; in another direction we see cattle grazing in the distance — here a stretch of meadow, and again large tracts of woodland and meadow, all beyond the water front. Nearer, or between the house and the water front, small groups of trees and single specimens have been planted which even now, while yet young, add much to the charm and attractiveness of the landscape, and when they shall have attained a full growth the beauty of the views will be greatly enhanced. In the care and development of the estate much credit is due for the good condition of everything to the faithful and persistent labors of Alexander McKay, Mr. Nevins's gardener, who is deeply interested in the development of the estate; we wish we could record more such instances of confidence between employer and employee. Your Committee are unanimous in their conclusion that this estate is one of the finest we have visited in point of natural views and unexcelled scenery. The judicious manner in which it is managed and developed has assisted in bringing us to this conclusion. We also desire to record our hearty appreciation of the very cordial reception given us personally by Mr. Nevins. His statement in regard to his estate is as follows:

Statement of Mr. Nevins.

Framingham, September, 1896.

I made my first purchase of land here in the spring of 1871. The farm consisted of one hundred and fifty-six acres, lying on both sides of the Sudbury River, and bounded on the south for nearly a mile by the Boston and Albany Railroad, and on the

east by Farm Pond. My first work was the taking away of all division walls, getting rid of old and worthless apple orchards, etc. Within a short time the City of Boston seized the Sudbury River, beginning the series of flowage dams, which in the case of my farm on Basin No. 2 has given us a very extensive water view. Within ten years of my first purchase, from neighbors moving away, etc., I had added a large area to the original place, the estate now consisting of nearly five hundred acres. The pasture, about a hundred and fifty acres, west of the river, is fenced; other than this there are no walls or fences on the place, or on the county road running through the farm, ornamental trees and shrubs proving a handsome and sufficient division line.

In 1888, to avail of the better site and extensive views, I moved my house and stable about seventeen hundred feet in distance, directly north of the old location; the new avenue, planting plans, grading, etc., having been laid out and superintended by Mr. Ernest W. Bowditch, landscape engineer and gardener. There is a drive around the entire place, furnishing easy and pleasant communication with all the fields, but the grounds about the house, with the lawns, ornamental planting, kitchen-garden, and main avenue comprise about seventy-five acres. The farm buildings, including the modern three-story barn, are at the extreme southerly end of this part of the estate, and near by is the garden, of a little over two acres, including a moderate amount of glass; and here my gardener, Alexander McKay, has raised the roses, violets, etc., which I have exhibited at the Society's shows, taking many first premiums. I append a report [1] from Mr. McKay on his method of raising violets in frames. Your Committee awarded him their first prize of $40 for these violets last spring.

Very truly, DAVID NEVINS.

To JOHN G. BARKER, ESQ.,
Chairman Committee on Gardens.

---

[1] See page 293.

CHRYSANTHEMUMS.

The interest in the cultivation of the Chrysanthemum seems to be as general, and the growers as enthusiastic, as ever. Your Committee feel justified in continuing these prizes for chrysanthemums, especially as ornamental plants. We have thought that each season has brought better and better plants, but there is no room for doubt that the plants at Mrs. Cheney's and at Mr. Walter Hunnewell's were the best your Committee have seen.

Mrs. Benjamin P. Cheney's Chrysanthemums, South Natick.

We had two competitors for the best house of Chrysanthemums, arranged for effect with other plants. Our first visit was at Mrs. Benjamin P. Cheney's (John Barr, gardener). Here we found a very choice lot of medium sized, well grown plants, forty-two in number, and each one a perfect specimen. They were propagated in January and shifted on to twelve-inch pots, and grown under glass all summer, on side benches, until the latter part of August, when they were moved to the house in which they were flowered. Mr. Barr says that in growing specimens one must try for varieties that are short-jointed, so as to be kept compact, and must also look out for pleasing colors; so we have to go back and grow old varieties to get those points, as it is usually hazardous to depend on the new. They take up a great deal of room if you intend doing them well, and require a great deal of air to keep the foliage; but, as a whole, Mr. Barr says he would rather grow a house of specimen bush plants than a house of plants with single stems, and, on a private place, the proprietor enjoys them more.

Mr. Barr further says that the great point in growing specimens is to keep the soil sweet, and not overdose with fertilizers, but give a little at a time and often.

Mr. Barr's list includes the following varieties, and he says that any of them will make nice plants with a little care:

White. — Ivory, Theo, Mme. A. Planchon, Mrs. Heale, Silver Cloud, Vernal Fall, Mrs. Robert Craig, Mutual Friend, Jennie Williams.

Yellow. — President Hyde, Gold Dust, Whilden, W. H. Lincoln, Mrs. Bishop, W. H. Rieman, Savannah, Georgiana Bramhall, Primula, Jardin des Plantes, C. Chalfant, Minerva.

Pink. — Pink Ivory, Nemesis, Mons. R. Dean, Iora, Zulinda, L. Boehmer, Mrs. Perrin, Eda Prass, Mrs. S. T. Murdock, Erminilda, Portia, Mrs. Goschen, Duchess of York.

Red. — William Seward, John Shrimpton, Sunrise, Columbine, Golden Hair, Cullingfordii, Mrs. E. M. Bigelow, Emma O. Farel.

The house in which these plants were grown is span-roofed, 50 × 20 feet, arranged for this occasion with a walk through the centre of the house, on the bench, with the plants on either side, so that visitors could look on all at one time. The plants were what may be termed medium in size, but were very uniform, and both flowers and foliage were in the most perfect condition, arranged with excellent taste as to color blending, harmonizing beautifully with the foliage plants, which were not so numerous or so large as to detract from the Chrysanthemums. It was well done, and was in every way a fine show.

In the house of Chrysanthemums on benches, there were eight hundred plants grown to one stem and bloom, which were propagated May 1st, and planted the second week in June, nine inches apart, on benches. There were thirty-six varieties, grown mostly for exhibition, with not two dozen blossoms lost out of the entire lot. Of new varieties Mr. Barr says he cannot say much, and finds it generally impossible to say much about them the first year. The stock, he finds, is generally all run out ; it is forced to death, so that sometimes they surprise one the second year. Mrs. Perrin and Modesto are varieties that will make names for themselves Gretchen Buettner is a good white. Violescent and Indiana have long necks, which is against them, but Violescent makes a nice flower. William Simpson is a good, clear pink, but there is not enough to it to make it a good staying variety. Mr. Barr says the trouble on a private place is to make room for Chrysanthemums. This year he potted his pinks in six-inch pots ; now, as the Chrysanthemums are used, he cleans out the benches and plants the pinks. The benches are made of such a size that six men can carry out a section filled with loam ; and in spring, when the time comes to plant Chrysanthemums, the benches of pinks are carried out, and benches with fresh soil are carried in for the Chrysanthemums. In this way the pinks are all saved, and the Chrysanthemums are not delayed.

Walter Hunnewell's Chrysanthemums, Wellesley.

Our next visit was at Walter Hunnewell's (T. D. Hatfield, gardener), where we saw some very fine specimens indeed. At our request Mr. Hatfield has given us for the Transactions a leaf out of the book of his own experience, which has extended over many years, he having been a successful grower and exhibitor for a long time. The many premiums he has received must be a sufficient evidence that he is an expert in the culture of this popular plant. During this same time he has furnished articles and notes on the Chrysanthemum for "Garden and Forest." Mr. Hatfield's account forms a valuable contribution to the Transactions of the Society, and will be read with interest.

He writes as follows:

Statement of Mr. Hatfield.

During the season large numbers of small pot Chrysanthemums are bought when in bloom. What to do with the plants when out of bloom is a question often asked. When it is remembered that Pompon varieties are quite hardy in Massachusetts, and many others nearly so, it will be seen that no pampering is necessary in wintering the plants over. Such as have been grown in pots are by the nature of their previous culture too tender to be turned out at once. A very cool cellar, such as a barn cellar, on a shelf near the light, would be a good place to keep them. A little frost would do them no harm. It is better to keep the plants cool, for if the place is at all warm they start into growth, and this weakens them. I have known them keep well in an attic, and also in a fairly warm cobbler's shop, near the windows. They freeze sometimes, but come out all right in spring. Here is a starting point. When spring comes most of the plants will be a mass of growing shoots. What is generally done is to divide up the old stool, and plant a number of shoots together. I do not desire to be tedious, or to hamper the grower with too many details, but it would be better if a few of the shoots, with a piece of root attached to each, could be started afresh into separate plants in sandy soil. This could all be done before June, after which there would be ample time to transplant the young plants and get good bushes before the autumn. Young plants such as I have indicated always have more vigor than

detached portions of the old stock. During the months of June and July, when the plants are growing fast, they should be frequently topped to induce stocky growth. Some localities are much infested with insects, which often blight the shoots so badly that few flower buds appear. A good plan in such cases is to place a frame work of mosquito netting about the plants, with an opening on one side. This will keep out their worst enemy, the chinch bug. Green and black aphides — small insects which cling to the leaves and buds near the ends of the shoots — often gather in such large numbers as to cripple the shoots seriously. The frequent application of tobacco dust will keep them in check. The plants should be taken up early in September, potted carefully, and stood in some shady place to recover. As cold weather comes they should be housed at night and stood out during the day time.

The large flowers we see on trained specimens are obtained by reducing the number of buds on a shoot to one only. More flowers, but smaller, would naturally come were all the buds allowed to remain. It is just a matter of taste. Small plants of all the leading varieties are offered by the principal florists in spring time. The newest are not always the best. Here is my selection for next season: Morning Crow, pink; Mutual Friend, white; O. W. Holmes, red; Marion Henderson, yellow; Norma, pink; Ivory, white; Columbine, bronze; Garza, white anemone; Savannah, yellow pompon; John Shrimpton, crimson; W. H. Lincoln, yellow; Joseph H. White, white.

This statement was written at the request of the Chairman of the Garden Committee, especially for amateurs and schools. It is in no sense a professional article.

T. D. Hatfield.

William Nicholson's Chrysanthemums, Framingham.

For Chrysanthemums on benches the other applicant was Mr. William Nicholson, whose plants were grown for commercial purposes, on a bench in the centre of a house 15 × 100 feet, and formed a very satisfactory exhibit indeed. We have requested some notes from Mr. Nicholson, and he says: "In regard to Chrysanthemums for 1896 I think quite a little progress has been made — that is, in separating the kinds for exhibition blooms and those for commercial purposes. Mine are all grown

for the latter purpose, therefore I have to discard a good many varieties that make very fine exhibition blooms, and give you the following list of what I think are the best market kinds to date:

"White. — Mrs. Bergmann, Ivory, Mrs. H. Robinson, W. G. Newett, Mrs. Phipps, Mrs. Jerome Jones, Minnie Wanamaker, Niveus, Pelican.

"Yellow. — Yellow Queen, Major Bonnafon, Gold Lode, W. H. Lincoln, H. W. Rieman, President Hyde for a pot plant.

"Red. — John Shrimpton and Cullingfordii. John Shrimpton is good for single stems and pot culture as well.

"Pink. — M. Neval, Mrs. Perrin, Helen Bloodgood, Mrs. S. T. Murdock, Erminilda, Maud Dean, Ada Spaulding, Ruth Ellis.

"Bronze. — Sundew, Harry May, E. G. Hill.

"The plants were propagated from May to the 20th of June, and planted on the benches from the 15th to the 25th of July, in compost the same as last year.

"This year in feeding I used considerable imported English bituminous soot and consider it very valuable in keeping the foliage in good condition."

The fine condition of the plants was the best evidence of good cultivation; two flowers were grown on each plant, each abundantly large enough for all commercial purposes. An experienced florist who accompanied us on this visit said that it was as good a house as he ever saw, and that the moderate sized flowers, of which these were so fine samples, would find a much more ready market than the larger ones.

Chrysanthemums at Oakmont, Lexington.

By James Comley.

Chrysanthemums are largely grown at Oakmont, many new varieties being obtained each season, a list of which, with their descriptions, is given for the benefit of those who may wish to add to their collections.

Adelaide. — Japanese. Deep rose pink; reverse, shell pink.

Autumn Bride. — Japanese, 1896. First exhibited as October Queen. Pure white, incurved, fine, early.

Buff Globe. — Japanese Incurved. A buff yellow sport from Good Gracious.

Buff Harry. — Incurved. Deep brownish yellow shaded buff; petals covered with glandular hairs.

Clarence. — Incurved. Bright red, golden reverse.

Columbine. — Japanese Incurved. Bright red, reverse bronze.

Daydawn. — Japanese. Creamy white, centre tinged sulphur; large, early.

Golden Sunset. — Japanese Incurved. Broad petals covered with glandular hairs; deep old gold.

Headlight. — Japanese Incurved. Deep carmine, reverse silvery pink.

Indiana. — One of the largest flowers to be found in the family, measuring twenty-two inches in circumference, nicely incurved; of a clear bright pink within, lighter color without.

Invincible. — Japanese. White, very large.

Jessie Whitcombe. — Japanese. Deep golden yellow, of immense size, and perfect form.

J. R. Keim. — Bright golden yellow, striped red.

Liberty. — Late; clear rich golden yellow.

Mrs. C. B. Freeman. — Clear yellow; a hirsute variety, being a sport from L. Boehmer.

Mrs. Battles. — Probably the same as Mrs. H. H. Battles.

Mrs. Helen Wright. — Pure ivory white, with age assuming the faintest tint of pink.

Mrs. H. H. Battles. — Japanese Incurved. Large, late, white shading blush at base.

Mrs. Perrin. — The rose pink Ivory; rose pink within, glistening pink without.

Mrs. R. Crawford. — Extra large, clear white, resembling Ivory, but larger; late.

Mrs. T. D. Hatfield. — Incurved. Pure yellow, fine form, high centre.

Mrs. W. W. Raynor. — Japanese. Beautiful clear white, early to mid-season.

Marion Cleveland. — Very large, early, ivory white, shaded delicate lemon at centre.

Midnight. — Crimson lake; very hairy.

New York. — Japanese Incurved. White; globular and massive.

Nanshon. — Japanese. White; globular; mid-season.

Phryne. — High rounded Japanese flowers; inner surface rich red bronze; reverse, bright chrome.

Pride of Castlewood. — Chinese; pure white.

Red Warrior. — Reflexed. Chestnut red, in the style of W. W. Coles.

Rena Dula. — Incurved Japanese. Deep rich pink.

Riverside. — Reflexed. Deep canary yellow; broad flat petals.

Signal Light. — Incurved Japanese. Red bronze.

Sibyl Kaye. — Japanese. Salmon pink; reverse, clear yellow.

The World. — Japanese. Very large flat flowers, with incurving petals, pure white.

Tippecanoe. — Japanese Incurved. Terra cotta, with lighter reverse; a fine exhibition flower.

Violet King. — Japanese. Pink shaded violet.

W. Matthews. — This must be the same as Governor Matthews. Pale pink, turning to white.

VIOLETS.

It is always the object of the Committee to offer new prizes as occasion requires, to encourage the good cultivation of any special subject. In accordance with this principle a prize was offered this year for the best bench or frames of violets, which are in such demand during the winter months that a stimulus to good cultivation is a public benefit. The violet disease has been very troublesome to many growers, and a few abstracts from the pens of experienced cultivators may not be out of place. Under the head of "Garden Notes," "Garden and Forest," for 1893, page 337, we read: "If we want strong clumps of violets to bloom well in winter, we must cut off the runners now (August 9), and not wait for the violet disease to show itself before remedies can be applied. We hope to ward off a possible attack of disease by the application of fungicides now. We have two batches, and one is given an application of sulphide of potassium at the rate of half an ounce to a gallon of water, the other a dusting of 'Grape dust' in twenty parts of air-slacked lime." On page 367 of the same volume, E. O. Orpet says, August 30: "Our first preparation for fall is to get the violets under glass as soon as practicable, and at this time every plant of the winter-flowering double kind, Lady Hume Campbell, is safely under glass, either in the frames or the heated house. The showery weather, and consequent humid atmosphere, give the exact conditions favorable to the development of disease, traces of which are already visible. This

removal of plants enables us to keep off overhead moisture. I have tried every known means to circumvent the disease, but have come to the conclusion that there is no cure for diseased plants in an advanced stage, and it is a waste of time and labor to try remedies. Much can be done, however, to keep healthy stock from becoming weak, by taking off all the runners at this season."

The paper of Mr. Alexander McKay, gardener to David Nevins, who has been a successful grower and exhibitor of violets for several years, which is appended, will be read with interest; the frames placed in competition for the prize were well grown; indeed, they were the best your Committee have seen.

Violet Culture in Frames.

The method of cultivation pursued is very simple, and differs in detail but slightly from that in general practice. Cuttings from the strongest runners are obtained at various times during the winter, being taken from the healthiest and most vigorous plants. They are trimmed and planted in boxes of sandy soil, and kept in the greenhouse until well rooted and growing vigorously. They are then transferred to the cold frames, where they remain until planted in the field.

A position where the plants will be shaded part of the day is chosen for their summer growth. A heavy coat of fine manure is given, spread on evenly.

Planting is done early in May, setting in rows eighteen inches apart each way. Hoeing to keep the weeds down and the soil loose, and pulling off useless runners as they appear, are strictly attended to during the growing season.

About the 20th of September the best plants are lifted and planted in frames, space enough being left between the plants to allow a free circulation of air. When planted they are thoroughly watered, and the sashes, lightly shaded, are put on. Air is freely given day and night as long as mild weather continues. When freezing weather arrives they are covered nightly with mats and shutters. Watering is performed with extra care from November to the end of March, being confined to parts showing dry on the surface.

The soil used is composed of three parts of loam and one part of old hotbed manure, with the addition of a light sprinkling of

wood ashes. This is composted a year previous to using, and turned over at intervals to insure an intimate mixing of the ingredients.

Respectfully yours,

ALEX. McKAY,
Gardener for David Nevins.

To J. G. BARKER, ESQ.

JAMES COMLEY'S VIOLETS

Were grown in a frame forty feet long by six feet wide, and were the California variety. The cuttings were placed in a cold frame June 1, well watered and kept shaded for ten days; then exposed to the sun, and kept well watered until September 1, when they were planted in the frame. They are now in a compost of one part good old cow manure and one of yellow loam, with a little ground bone dust, and are given plenty of air every fine day. The growth was vigorous and free from disease, and the flowers were produced in abundance.

CARNATIONS

Are so deservedly popular that your Committee thought it wise to offer a premium for the best house. There has not been the competition we expected, but we have seen enough under cultivation to satisfy us that the encouragement which the premium offers is a step in the progressive line of Floriculture. The Carnation is and always will be popular, especially for winter cut flowers, their keeping qualities being so excellent. There is but little that can be added to the many articles on Carnation culture in the popular horticultural journals and the Proceedings of the American Carnation Society. William Nicholson, who made the only entry, sends the following notes:

"In regard to Carnations I have very little to say at present. On account of the dry weather my plants will be quite small to take in, but they are very nice, clean, and healthy. I have a few of the new varieties on trial. Edith Foster, white, is a very promising one, and Eldorado, yellow, which I had last year, I consider one of the very best sent out. I have two or three very promising seedlings of my own, but cannot tell how they will turn out until after another year's trial. There are lots of new

seedlings sent out every year, but very few of them reach the top of the ladder, as the standard is getting very high, and they must be exceptionally good to make a mark for themselves."

Mr. Nicholson's houses were in excellent condition; the plants very healthy, with no sign of disease. High cultivation and cleanliness are the features that characterize all that Mr. Nicholson takes hold of, and his well-merited success is due to his care and skill.

FRUIT GARDEN.

The only application for this premium for the best Fruit Garden was from Mr. Warren H. Heustis, and was made with particular reference to his Strawberry Garden, which contains about one acre. The varieties grown are principally the Marshall and Belmont. The latter variety, Mr. Heustis says, is no back number with him by any means, as it holds it own for productiveness and for price in the Boston market. The plants are set in rows four feet apart and two feet in the row, and allowed to make a bed. A path a foot wide is cut out in the spring, and the plants are thinned out where they are too thick. The Marshall, Mr. Heustis finds, has many plants with no berries set on them, but he says these barren plants will fruit another year. The condition and productiveness of this acre of strawberries were the best evidence of good cultivation; it was quite equal to any acre of strawberries we have seen.

In addition to making a specialty of strawberries, Mr. Heustis is gradually getting into other fruits, — pears, apples, gooseberries, and currants, — and says that it takes the best of land for these purposes, which is a soil bordering on clay. On such a soil the fruit comes very smooth and fair, with scarcely any disease. There are about one hundred and seventy-five young pear trees, divided between Bartlett, Bosc, and Dana's Hovey. Among apples the Gravenstein is considered the best all-around apple for early autumn. We hope to have the pleasure of recording Mr. Heustis's success with his fruit trees at a future time.

VEGETABLE GARDENS.

The competitors for this prize were Col. Frederick Mason, of the Riverside Farm, Taunton (E. C. Lewis, manager), and Warren Heustis & Son, of Belmont. Both these gentlemen have furnished statements, which follow:

STATEMENT OF E. C. LEWIS.

TAUNTON, MASS., Sept. 19, 1896.

JOHN G. BARKER, ESQ.:

Dear Sir: In reply to your inquiry in regard to the crops we grow, mode of cultivation, etc., I would say that the farm consists of fifty acres of cleared land; namely, ten acres of river meadow with clay subsoil, nearly all of which has been mowed twice this season, and forty acres of upland sandy loam soil with part clay subsoil and part coarse sand or gravelly subsoil.

Thirty acres are down to English grass, which has been cut twice this season.

We use Canada hard-wood ashes for our grass land, applying at the rate of one ton per acre each year in the fall months, and one hundred pounds of nitrate of soda per acre in the spring.

When we re-seed or seed down we use about five hundred pounds of ground bone per acre in addition to ashes. We keep a small herd of Jerseys, consisting of seven cows and one bull, which are fed during the summer months, from April to the end of October, on rye, oats, and peas; oats and vetches, or tares, sweet corn fodder, etc., of which we usually take two or three crops from the same land, five or six acres of land being used for that purpose, and some of the fodder being cured for winter use.

We have about five acres of land planted to roots and vegetables, consisting of one acre of mangolds and sugar beets, the land for which was manured with stable manure at the rate of eight cords per acre and eight hundred pounds of Armour's Soluble Fertilizer, all applied broadcast and worked in thoroughly with a wheel harrow, after which we used a Thomas smoothing harrow and then rolled down the land with a light roller. The seed was planted in rows two feet apart, at the rate of about six pounds per acre. We commenced cultivating as soon as the beets got up two inches, and thinned them when six inches high with a common hoe, leaving them from twelve to fifteen inches apart. We estimate the crop as it now stands at from forty to forty-five tons on the acre.

The remainder of the five acres of land is planted to potatoes, squashes, and about one hundred other varieties of vegetables, nearly all of which are planted so as to use a pony and cultivator

between drills. We have water laid on about three acres, supplied by a windmill.

The farm is owned by Col. Frederick Mason.

Warren H. Heustis's Vegetable Garden.

Mr. John G. Barker, *Chairman Garden Committee:*

The Vegetable Garden entered by me contains about twelve acres, consisting of light, low, and soil bordering on the clay. The farm is devoted to a general assortment of garden crops, namely: parsley, carrots, lettuce, onions, spinach, dandelions, cucumbers, cabbages, beans (string and shell), salsify, squashes, melons, corn, rhubarb, and celery. We grow about three hundred thousand celery plants, divided about equally between Paris Golden and Giant Pascal, with a few thousand Boston Market. The early celery is set two feet by four and one-half inches and lettuce or spinach is sown between the rows; for later we set four feet by four and one-half inches. Lettuce is sown every week, using Black Seeded Tennis Ball altogether. For parsley we use the Double Curled; carrots, the Intermediate; onions, the Danvers; spinach, the Round Thick Leafed and the Pointed Leafed; dandelions, the Improved Thick Leafed. Of cucumbers we have the White Spine, and use about five hundred hotbed sashes. Of cabbages we have this year about ten thousand, equally divided between All Seasons, All Head, and Number Two. Of beans we have the Golden Wax and Goddard. The cabbages, cucumbers, and in fact all the crops where it is possible, are succeeded by celery. We use no commercial fertilizers whatever, having an abundance of manure from about twelve hundred pigs. For irrigation we use a sixteen-foot Eclipse windmill and a Blake steam-pump.

Warren H. Heustis.

Bussey Institution, Jamaica Plain.

On the 21st of March the Committee visited the greenhouse of the Bussey Institution to see the hardy shrubs and herbaceous plants, forced by the skilful gardener, Charles Jackson Dawson, whose interesting statement follows:

BUSSEY INSTITUTION OF HARVARD UNIVERSITY,

JAMAICA PLAIN, MASS.

DEAR MR. BARKER:

Referring to yours of August 12 I would say I should be pleased to give you a brief account of the greenhouse your Committee visited on the 21st of March, 1896.

With a few exceptions, the house (which is sixty-five feet long by twenty feet wide) contained nothing but hardy plants, which were forced out of season. The house was an object lesson as to what can be forced with little difficulty, the time taken for bringing the various sorts into bloom varying from ten days to ten weeks. Our method is to store all the material that is to be bloomed in cold pits and frames as soon as the frost appears in autumn, and leave them there at any rate until the turn of the year, January 1st, but more generally until February 1st.

The plants are brought in by instalments, the time depending entirely upon how early or late the plants naturally bloom out of doors. For instance, *Kalmia latifolia*, which here blooms outdoors about the middle of June, must be brought into a moderate heat about the first of January. On the other hand, with *Erica carnea*, which is one of the earliest spring-blooming shrubs, it is only necessary to allow about ten days at this season in order to bring it into bloom.

It might be well to arrange the plants thus brought into bloom in three classes, viz.: Shrubs, Herbaceous Plants, and Hardy Bulbs.

Amongst the Evergreen Shrubs the most satisfactory were:

**Andromeda floribunda.*	*Erica carnea*, in variety.
" *Japonica.*	*Genista Germanica.*
" *polifolia.*	**Kalmia glauca.*
* " *speciosa.*	* " *latifolia.*
Berberis Aquifolium.	*Ledum latifolium.*
**Daphne Cneorum.*	*Leucothoë Catesbœi.*

**Rhododendron Catawbiense* hyb., the tender sorts being the most satisfactory for forcing.

The Deciduous Shrubs that were forced are numerous, so I will only mention the most satisfactory:

**Azalea*, Ghent Hybrids.
* " *mollis.*
**Cercis Japonica.*
**Cytisus scoparius.*
**Deutzia gracilis.*
Exochorda grandiflora.
Lonicera tatarica.
**Prunus cerasus fl. pl.*
**Pyrus spectabilis fl. pl.*
Rhododendron Rhodora.
Ribes aureum.
Rosa multiflora.
Rosa multiflora, the Dawson.
Spiræa arguta.
" *Thunbergii.*
* " *Vanhouttei.*
**Staphylea colchica.*
Syringa Chinensis.
* " *vulgaris* Charles the Tenth.
* " " Marie Lagrange.
**Viburnum opulus.*
" *plicatum.*

You will notice that I have marked the most desirable shrubs with a star (*).

The Herbaceous Plants that were in bloom at the time were few. The noteworthy were:

Astilbe (Spiræa) Japonica.
" " " *multiflora compacta.*
Cypripedium acaule.
" *spectabile.*
Dicentra spectabilis.
Phlox subulata, in varieties.
Polygonatum giganteum.
Primulas.
Spiræa aruncus.
Viola palmata var. *cucullata.*
" *pedata.*

I cannot pass the Cypripediums without calling special attention to these two beautiful native Orchids. Their forcing qualities are grand, the results being more than satisfactory, and I really considered some pans of *Cypripedium spectabile* the most beautiful plants in our range of houses at the time.

The promiscuous display of Spring Flowering Bulbs scattered throughout the Flowering Shrubs helped to make the house one blaze of bloom. They consisted of:

Dutch Hyacinths.
Tulips.
Hardy Narcissuses.
Erythroniums.
Lily of the Valley.
Italian Anemones.
Arisæmà triphyllum.
Camassia esculenta.
Iris Persica.
Lilium Harrisii.
" *longiflorum.*
" *umbellatum.*
Muscari botryoides.
" " *alba.*

And others, all in great variety.

The above-mentioned plants, with the exception of a few Ericas, Acacias, Indian Azaleas, and Genistas, made up the contents of the house, showing what a complete and satisfactory show can be made during the winter with our beautiful hardy spring-flowering plants, both native and foreign.

To set forth in detail the many points necessary to bring this class of plants to the proper stage would encroach too much upon your time.

Hoping this will prove what you desire,

I remain very sincerely,

CHARLES JACKSON DAWSON.

AUGUST 28, 1896.

CAMELLIA HOUSE ON THE ESTATE OF THE LATE FRANCIS B. HAYES, OAKMONT, LEXINGTON.

Not since the days of Hovey and Wilder has this once popular flower been grown to the perfection in which it is now seen at Oakmont; indeed at the places mentioned, although there were fine collections, it was not cultivated to the extent that it is here. Many of the plants here were from Mr. Wilder's collection. It is true that the Camellia is not the popular florist's flower that it once was; still it is altogether too useful to be discarded. If the rose has supplanted it in a great measure, for certain decorative purposes it is superior to the rose. One of the reasons it succeeds so admirably here is the fact that the plants are grown in a bed specially prepared for them. This bed is thirty feet square, and a few are grown in pots. The bed has been planted nine years; the largest plant in the house stands twelve feet high and ten feet through; the trunk is eighteen inches in circumference. This plant has produced the present season more than a thousand flowers and buds. The collection comprises fifty-nine varieties. The varieties planted out are:

Alba plena (the old Double White). — Flowers pure white; large, full; petals round, evenly and regularly arranged; form perfect.

Armida Nova.

Candidissima. — Late blooming, double white; a very compact grower; the plants have a shapely appearance, and flower very freely.

Charles Downing.

C. H. Hovey. — Flowers dark velvety crimson; petals round and symmetrical, imbricated; habit vigorous; foliage rich and ample.

C. M. Hovey. — Flowers scarlet crimson, large and regular in outline; petals finely formed and of great substance; growth vigorous; habit fine.

Countess of Orkney. — Flowers white, often flaked with crimson; of medium size, full, cupped; petals slightly incurved in the early stages of the flower, round, even, and regular; foliage fine.

Dunlap's White.

Fanny Bolis.

Fimbriata. — Flowers white, large, full, flattish; the petals are evenly and regularly arranged, the edges finely serrated so as to give them a fringed appearance. It is a variety of *alba plena*, but less vigorous.

Imbricata. — Flowers large, perfectly round; cherry red, shaded with carmine lake; regularly imbricated; remains a long time in bloom.

Madame Louis Van Houtte. — A sport from Jenny Lind. Of vigorous growth and exceedingly floriferous. Flower of good size; rich rose, shaded and faintly reticulated with clear carmine and bordered with pale rose.

Mrs. Abby Wilder. — Flowers white, occasionally faintly shaded with flesh color and striped with lake; of medium size, full, imbricated, perfect in form; foliage and habit good.

Mrs. Cope. — Flowers blush, flaked and dashed with carmine; of medium size, full, cupped; petals rounded, even, and regular; habit good.

Pæoniflora.

President Clark.

Reine des Beautés. — Flowers pale flesh color, occasionally tinged or striped with rose; of medium size, full, flattish; petals round; foliage and habit fine.

Sacco. — Light rose; a very free flowering variety.

Sarah Frost. — Flowers deep rosy pink, sometimes rayed with white; large, full, flattish; petals round, even, and regular; habit good.

Wilderi. — Delicate clear rose; of the most perfect rose shape, retaining its beauty a long time. Originated by the late Hon.

Marshall P. Wilder, and first exhibited at the rooms of the Massachusetts Horticultural Society, February 14, 1846.

The splendid condition of the plants was ample proof that the best mode of cultivation had been adopted; it is doubtful whether another such collection can be found — certainly not in this vicinity. A writer in the "Encyclopædia Britannica," whose name is not given, says: "To be seen in their full perfection Camellias should be planted out in borders of properly prepared soil under glass, but these borders should be very effectually drained, and of such a mechanical composition as never to become soddened, for the plants require to be almost deluged with water when making their growth and when developing their blossoms. The borders, moreover, when the plants have become well established and the soil full of roots, will require to be assisted by top dressings and by applications of liquid manure. They by no means require a heated structure, nor too much sunlight, but when well established in a cool and somewhat shaded conservatory, may become a source of infinite delight to those who have a love for flowers."

William Nicholson's House of Forced Tomatoes, at Framingham.

Mr. Nicholson writes:

"In regard to my house of Tomatoes, they were sown in boxes in October, afterwards transplanted into flats, and again transferred into six-inch pots, and were planted on benches the middle of December, after my chrysanthemums were all cut, in the same loam that the chrysanthemums were grown in, which was well fertilized with Jeffard's animal fertilizer. We also top-dressed them with it about once in two weeks when they began to bear, and fed them with liquid manure. We began to pick the fruit in March, and there was quite a crop on them when we pulled them out on the 15th of July. We cut about four thousand pounds from this house, fifteen by one hundred feet, and were troubled very little by club-root this year. I think it is on account of using a good quantity of lime. I find that limewater is a very good thing for club-root in roses also."

The following article, taken from the "Florists' Exchange," September 5, 1896, is reproduced here as of value to all who are engaged in this industry:

Winter Forcing of Tomatoes.

Preparations for this work should now be well under way, and if the tomato seed is not already sown no time should be lost in doing so, for every day is of value now. The seed needs to be sown in a light soil, and just as soon as the plants are large enough to handle pot them up, singly, in two-inch pots, using a nice light liberal soil. Grow the plants on carefully and avoid drawing or coddling them, but make a point of keeping them stocky yet not starved. It is essential to their welfare that they never suffer from any kind of neglect. Immediately the roots spread all through the soil, pot up into, say, a four-inch pot, using a more retentive soil, which should consist of good sound loam and short, well-rotted manure. Attend carefully to the watering and keep the plants moving lively, but not forced. Then, as soon as they will stand it, get them potted into their fruiting pots, or planted out on the bench, if so desired. To get early fruit, however, pots are to be preferred, the roots being then more under control.

For the final potting the soil requires to be kept more lumpy; try and retain all the fibre possible, and see that there is ample drainage, so arranged that the water will get away freely. Use a little solid, yet well-rotted, horse or cow manure. A small portion of quarter-inch bone may also be used, but it is better to provide for feeding after the pots are full of roots than to make the soil very rich at first; for this reason, the more growth the less liable is one to get a good set of fruit; and this is important, for on an early set depends whether or not tomatoes can be picked in December and January.

As the plants grow, be careful to trim away all lateral or side shoots. It is better to train to a single stem and keep to that unless the plant is very thrifty and shows an inclination to make a good second stem, which frequently happens.

Another point to watch is the distribution of the plants, that they will get the greatest amount of sunshine. That brings us to the question of training, and of doing this there is a variety of methods. Some adopt only a single stake, others make a

wooden horse or inverted ∧, leaving a path so that two sides can be easily attended to, and in this particular, doubtless, this method is by far the best. Our preference is given to the system adopted by W. Turner, at Rockwood, Tarrytown, N.Y. He makes a wire arch on his centre beds, about seven feet high, which he places inside his two rows of plants. This arch is not acute, but well rounded, so that there is abundant room for the plants to grow and rest upon it. A board is placed on the ground underneath the arch, which is high enough to allow of a man doing the work of tying and pruning.

The houses are span-roof, eighteen feet wide, so that he gets four rows of plants, two being on the centre bed and one each on the side benches, the plants, individually, standing about eighteen inches to two feet apart. Sometimes they are in pots; at others, they are planted out.

The next question — and a vital one — is that of varieties. Of these there are but few, and we name them in order of excellence, according to our experience: Lorillard, Essex Hybrid, Early Michigan, Aristocrat, Early Ruby. Very frequently Dwarf Champion is used, and with many it is popular for side benches, but for this purpose we think Early Michigan is better. The fruit is even-surfaced, of good color, and medium size. Early Ruby will produce lots of fruit, but the corrugations detract from its value. Aristocrat is a heavy tomato, but Lorillard and Essex Hybrid are preëminently the two best.

J. W.

The Committee have made the following awards:

Special Prize from the John A. Lowell Fund.

For the best house of Chrysanthemums arranged for effect with other plants, Mrs. Benjamin P. Cheney,	$50 00
Second, Walter Hunnewell	30 00

Society's Prizes.

For the best house or houses of Chrysanthemums grown on benches, Mrs. Benjamin P. Cheney . . .	50 00
Second, William Nicholson	30 00
For the best bench or frames of Violets, David Nevins,	40 00
Second, James Comley	20 00

For the best Carnation house, William Nicholson . .	$40 00
For the best Fruit Garden, Warren H. Heustis . .	50 00
For the best Vegetable Garden, E. C. Lewis . . .	50 00
Second, Warren H. Heustis	30 00

Gratuities.

Bussey Institution, for a house of Forced Spring Flowering Plants	30 00
James Comley, for a house of Camellias planted in the ground and well grown	30 00
William Nicholson, for a house of Forced Tomatoes .	30 00

Amount appropriated		$500 00
Awarded for prizes	$390 00	
Awarded for gratuities . . .	90 00	
	$480 00	
Balance unexpended . . .	20 00	
		$500 00

Respectfully submitted,

JOHN G. BARKER,
AZELL C. BOWDITCH,
J. WOODWARD MANNING,
E. W. WOOD,
C. N. BRACKETT,
JOSEPH H. WOODFORD,
HENRY W. WILSON,
JACKSON DAWSON,
Committee.

REPORT

OF THE

COMMITTEE OF ARRANGEMENTS

FOR THE YEAR 1896.

Another year has passed away, and we are called upon to chronicle the events pertaining to our part of the success attained by our exhibitions.

The same obstacles obstruct the way that we pointed out in our last report, and until we have more commodious rooms in which to hold our exhibitions, and suitable accommodations for the comfort of visitors, we cannot expect enhanced receipts for admission.

The arrangements of the halls have been good, taking into consideration the limited space at our command, and we have often been congratulated on their splendid appearance, and more particularly at the Chrysanthemum Show. We are indebted to a good friend of the Society, Jerome Jones, Esq., for the loan of three splendid vases to complete the number applied for by exhibitors, and these together with the five belonging to the Society when filled with chrysanthemums were grand features of the exhibition. If the same number of prizes for large vases of chrysanthemums or other long-stemmed flowers are continued in future Schedules, this will make a good chance for some kindly disposed person to distinguish himself or herself by contributing to the Society some vases to fill up the deficiency which now exists.

We constantly bear in mind that, without the hearty coöperation of the gardeners, our exhibitions would be utter failures and without interest to them or the public; therefore our Society is under great obligations to this class of intelligent men, and our

thanks are tendered to them for their enthusiastic interest in the cultivation and exhibition of flowers and the success of our exhibitions.

We would at this time call the earnest attention of the gardeners to the altered rules and prizes in the new Schedule, now being revised by the Committee on Establishing Prizes, for some of the alterations are of the utmost importance to exhibitors, and deserve very careful attention.

We are very happy to say that, notwithstanding the same insufficient accommodations are in use as last year, the arrangements of the halls have been so carefully studied and carried out that no friction has occurred and all unpleasantness has been avoided.

The amount of money which was placed at the disposal of this Committee for extraordinary expenses has been judiciously expended, always having in view the best interests of the Society.

The Treasurer reports the receipts for admission to the

Spring Show	$555 25
Chrysanthemum Show	767 50
Total	$1,322 75

all of which has gone into the treasury of the Society.

The receipts at the Chrysanthemum Show were not so large as last year, although the show was very much superior; probably owing to two days of stormy weather and inadequate accommodations for the comfort of visitors.

All of which is respectfully submitted.

Jos. H. Woodford,
Chairman.

REPORT

OF THE

Committee on School Gardens and Children's Herbariums,

FOR THE YEAR 1896.

By HENRY L. CLAPP, Chairman.

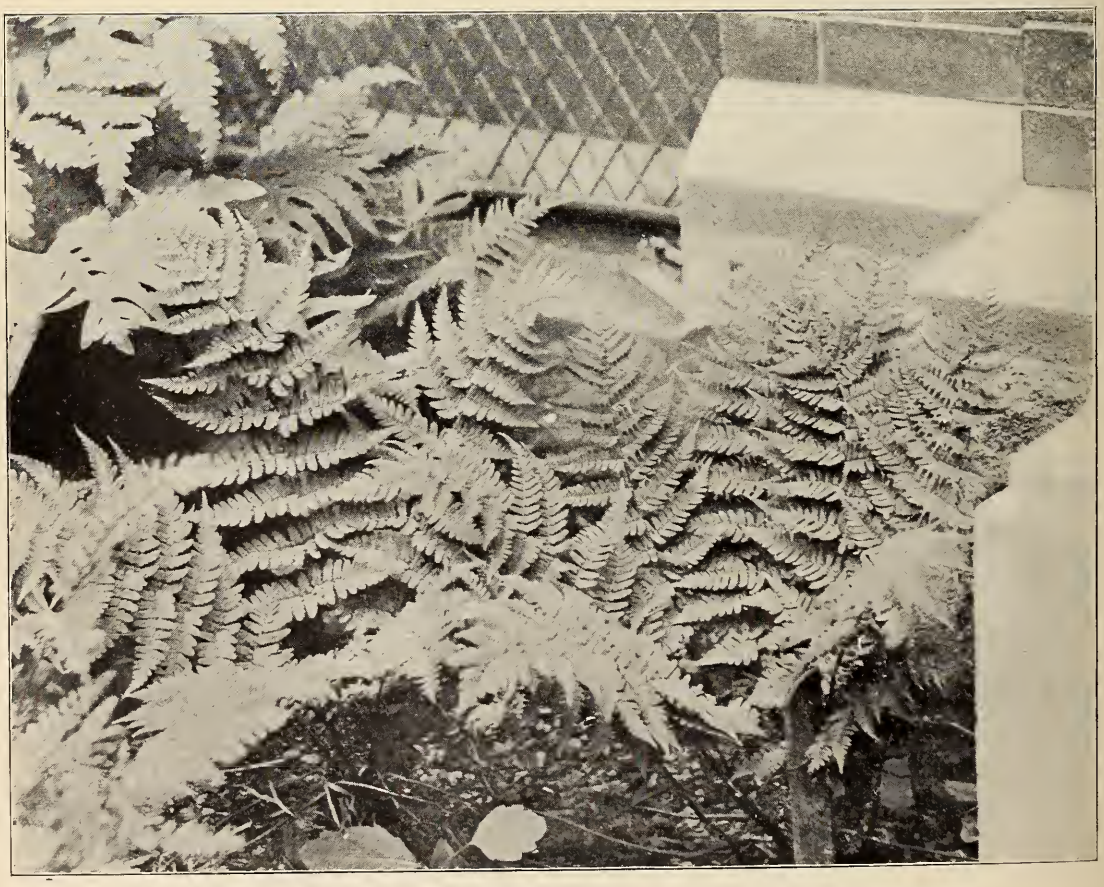
GEORGE PUTNAM SCHOOL GARDEN, ROXBURY.

Twenty-seven new species and varieties were placed in the garden during the season of 1896, namely:

Antennaria plantaginifolia.
Apios tuberosa.
Aralia nudicaulis.
Aspidium cristatum var. *Clintonianum.*
Aspidium Goldianum.
" *spinulosum* var. *dilatatum.*
Bidens frondosa.
Galium Aparine.
Geranium Carolinianum.
" *Robertianum.*
Habenaria lacera.
" *orbiculata.*
" *virescens.*
Helianthemum Canadense.
Hieracium venosum.
Houstonia cærulea.
Hypoxis erecta.
Lilium Canadense.
Lycopodium lucidulum.
Pedicularis Canadensis.
Phegopteris hexagonoptera.
Prenanthes serpentaria.
Pteris aquilina.
Trientalis Americana.
Trillium erythrocarpum.
" *grandiflorum.*
Viola striata.

The ground was well fertilized in the spring at a cost of five dollars. Two new beds of hardy chrysanthemums were made. In October every teacher's desk in the district was decorated with chrysanthemums in variety. The garden contains eleven varieties of German iris. The *Clematis paniculata*, *Euonymus radicans*, tiger lilies, asters, and golden-rods have made exceptionally

ASTER CORDIFOLIUS. — George Putnam School Garden.



A CORNER OF THE FERNERY. — George Putnam School Garden.

FOURTH GRADE PUPILS OBSERVING. — George Putnam School Garden.

fine growths, owing to the unusual moisture of the season. Six species of native asters have been introduced into the girls' yard spontaneously by seed, and have made vigorous growths. Single plants springing from seed scattered at random blossom much more profusely than clumps of two or more years' standing. Thorough division of clumps is essential to the vigor of the plant and the production of blossoms. A few plants have died out, but most of the plants originally introduced have increased greatly and might aid in establishing other gardens. There are now over one hundred and fifty species of native wild plants in the garden, not to speak of a great variety of hardy cultivated plants.

The garden has been used for observation more this year than in any previous year, composite flowers and ferns receiving the most attention. The pupils of the last graduating class studied minutely fifteen species and varieties of ferns, and twenty-two of these pupils introduced ferns into their own gardens at home. The fernery in the angle of the school building on the north side was visited many times for the comparison and identification of species. Many kinds of seed vessels of flowers, as well as the flowers themselves, have furnished excellent material for drawing, especially with pen and ink.

The influence of this work has been felt in the preparation of herbariums, a majority of the exhibitors at the last Herbarium Exhibition having enjoyed the advantages of this garden. It is hoped that the educative value of the garden may be shown by larger numbers of pupils from year to year.

In comparison with European countries, especially France, Germany, Austria, Sweden, and Russia, school-garden privileges in this country are exceedingly limited. Since 1877 every public school in Berlin, a large *city* in Prussia, has been regularly supplied with plants for study every week, elementary schools receiving specimens of four different species and secondary schools six. During the summer at six o'clock in the morning two large wagons start from the school gardens, loaded with cuttings packed and labelled for the different schools. The daily papers regularly announce what plants may be expected, and teachers consult with the gardeners as to what ought to be sown or planted. Teachers take their classes into the school gardens for lessons in botany, and are aided by the gardeners who cut the specimens.

Still more significant is the recent establishment of many school

gardens in Southern Russia. In one province two hundred and twenty-seven schools out of a total of five hundred and four have school gardens, whose total area is two hundred and eighty-three acres. In 1895 these gardens contained one hundred and eleven thousand fruit trees and two hundred thirty-eight thousand three hundred planted forest trees. In them the schoolmasters teach tree, vine, grain, garden, silkworm, and bee culture. They are supported by small grants of money, from the country and district councils. In the villages small orchards and kitchen gardens are connected with many primary schools. This movement has also widely spread over different provinces of Central Russia. It is worthy of the attention of a Society like this, at least so far as calling the attention of school officials to the rounding out of a city child's education in a very practical manner. The fundamental ideas obtained by a child from direct contact with the things found in the gardens mentioned are not inferior to any ideas obtained from the objects commonly found in a city.

CHILDREN'S HERBARIUMS.

The Children's Herbariums, November 27 and 28, 1896, filled the Lower Hall. Most of the exhibitors of this year had exhibited specimens before, and had learned by observation how to mount plants with the utmost neatness; consequently no careless or hasty work was to be found in the entire exhibit. Those who are able to compare this exhibit with that of 1891 can appreciate the manifest progress that has been made.

The herbarium of Arthur E. French, of Sudbury, was a model of neatness. One can imagine how extensive his explorations must have been, and how much labor was involved in the preparation of his exhibit, by considering the following facts: In 1895 he obtained the first prize for one hundred and twenty-five flowering plants, the first prize for twenty specimens of sedges, and an extra award for excellence in pressing and mounting specimens. This year he exhibited fifty grasses, including thirteen species of Panicum, and one hundred and twenty-five flowering plants, twenty sedges, and ten ferns, all different plants from those which he had previously exhibited.

Arthur C. Faxon, of Jamaica Plain, made an exhibit equally notable, in the form of a fifth contribution to our Annual Herbarium Exhibition. He exhibited one hundred and twenty-five herbaceous plants, grasses, sedges, and ferns. When we consider that these were all different species or varieties of plants from the many which he has shown at four previous exhibitions, we can understand how diligently he has worked and how carefully he has observed. His specimens were complete and accurately named. Among them were the rare asters *A. Faxoni*, *A. Herveyi*, *A. infirmus*, and *A. subulatus*.

Miss Lura J. Durgin, of Boston, received the first prize for one hundred and twenty-five flowering plants, which were finely mounted and showed every essential part. In the case of some specimens the upper part of the plant, including the flowers, was on one sheet and the lower part, including the root, on another.

The Committee, with the aid of all the expert assistance they could call in, were not able to name some specimens in this col-

lection. This shows the need of a permanent herbarium for reference.

Miss Carrie P. Webber, of Bedford, who had exhibited here previously, sent one hundred additional flowering plants and fifteen ferns, the mounting and naming being well done.

Five girls and one boy from Roxbury, Lulie D. Ellis, Mabel M. Wood, Ada C. Wood, Isabelle F. Wiggin, Genevieve A. Goudy, and John P. Goudy, exhibited excellent mounts of ferns.

Gordon Weinz, nine years old, who took a prize for fifty flowering plants in 1895, sent in twenty-five additional flowering plants this year.

There was only one collection of sprays of leaves, which numbered thirty-nine sheets. Like the other herbariums, this one, sent by Katherine A. Dwyer, of Roxbury, showed great care in its preparation.

Mention should be made of Phillips Barry's gift of thirty-six sheets of botanical specimens to the George Putnam School, making in all one hundred and twenty-seven sheets that he has given to the school. These with the eighty-four sheets of leaf-sprays presented by Arthur C. Faxon make a working herbarium of over two hundred specimens.

The attendance was eminently satisfactory, the estimate being about one thousand persons during the two days of the Exhibition. Parents, teachers, and children asked a great many questions, and they will be heard from next year.

The thought seemed to prevail that the exhibition was the work of schools and not of individual pupils. Teachers asked, "Now, to what grade does this pupil belong?" Parents seemed to think their children could take no part in the work unless they came in with a school. It is hoped that parents and teachers will induce individual children to engage in preparing herbariums. It is only in getting together a school herbarium that any large number of children may be expected to continue their efforts.

The prize of fifty ferns offered by Mr. George E. Davenport for the best collection of native ferns sent to the exhibition attracted the attention which it deserved. There were no entries for this prize, owing to a mistaken idea that ferns once exhibited here could not be entered again for this special prize; therefore the parts of fern collections that have been exhibited here annually were left at home. Next year Mr. Davenport will offer two

prizes of ferns, and, now that the matter is understood by those who have exhibited ferns in this hall, we have reason to expect to see some large and fine collections.

It seems proper here to mention that a fine botanical building is to be erected at a cost of $250,000 in the Botanical Garden at Bronx River Park, New York. It is but the start of an institution which it is expected will be superior to any similar one in the country. Particular mention is made of an herbarium and a place for it. Perhaps the Massachusetts Horticultural Society in erecting a new building is not going to be outdone by an Association in New York with $750,000 in hand.

The amount appropriated by the Society for the use of this Committee was . .		$250 00
Awarded for Herbariums	$55 75	
Awarded for School Gardens . . .	15 00	
Suffolk Engraving Company (cuts) . .	10 00	
Printing	37 50	
Advertising	11 40	
Paper	9 81	
Expressage, posters, stamping, etc. . .	6 54	
		146 00
Balance unexpended		$104 00

HENRY L. CLAPP, Roxbury,
MRS. H. L. T. WOLCOTT, Dedham,
GEORGE E. DAVENPORT, Medford,
MISS KATHARINE W. HUSTON, Roxbury,
MRS. P. D. RICHARDS, West Medford,
WILLIAM P. RICH, Chelsea,
W. E. C. RICH, *Secretary*,
99 Moreland st., Roxbury, Mass.

Committee on School Gardens and Children's Herbariums.

PRIZES AND GRATUITIES AWARDED FOR SCHOOL GARDENS AND CHILDREN'S HERBARIUMS.

SCHOOL GARDENS.

George Putnam School, first prize	$15 00

CHILDREN'S HERBARIUMS.

Flowering Plants. — For one hundred and twenty-five specimens, first prize, Lura J. Durgin	5 00
Second, Arthur C. Faxon	4 00
Gratuities: —	
Arthur E. French, for one hundred and twenty-five additions	7 00
Carrie P. Wilder, for one hundred additions	3 50
Gordon Weinz, for twenty-five additions	1 50
Ferns. — For twenty specimens, first prize, John P. Goudy	3 50
For fifteen specimens, second prize, Carrie P. Webber,	2 00
For ten specimens, first prize, Ada C. Wood	2 00
Second, Isabelle F. Wiggin	1 00
Gratuities: —	
Arthur E. French, for ten additions	3 00
Genevieve A. Goudy, for ten additions	2 00
Mabel M. Wood, for ten additions	2 00
Lulie D. Ellis, for seven additions	1 50
Arthur C. Faxon, for five additions	1 50
Grasses. — For fifty specimens, first prize, Arthur E. French	5 00
Gratuity: —	
Arthur C. Faxon, for nine additions	2 25

SEDGES.

Gratuities : —

Arthur E. French, for twenty additions . .	$3 00
Arthur C. Faxon, for eleven additions . .	2 00

LEAF SPRAYS. — For thirty-nine sheets, first prize, Katherine A. Dwyer 2 00

Gratuity : —

Arthur C. Faxon, for thirty additions . . .	2 00
Total for Herbariums and Gardens . .	$70 75

REPORT

TO THE

STATE BOARD OF AGRICULTURE

FOR THE YEAR 1896.

By GEORGE CRUICKSHANKS, of Fitchburg.

The Massachusetts Horticultural Society began the work of the year with a course of Lectures and Discussions on subjects related to the art and science of horticulture, by the following-named speakers:

January 11. Hardy Garden Plants, by E. O. Orpet, South Lancaster.

January 18. Conservatism in Scientific Agriculture, by Prof. W. H. Jordan, Orono, Me.

January 25. Stove Plants in their Native Tropics, by Prof. George L. Goodale, Cambridge.

February 8. Seed Control: Its Aims, Methods, and Benefits, by Gilbert H. Hicks, Washington, D.C.

February 15. Some Scale Insects, by Prof. L. O. Howard, Washington, D.C.

February 29. Some Tendencies and Problems in the Evolution of Species among Parasitic Fungi, by Prof. George F. Atkinson, Cornell University, Ithaca, N.Y.

March 14. Ornamental Planting for Parks and Public Grounds, by William S. Egerton, Albany, N.Y.

March 21. Grasses, by F. Lamson-Scribner, Washington, D.C.

March 28. Manuring Orchards, by Prof. Edward B. Voorhees, New Brunswick, N.J.

April 11. Mushrooms, Edible and Poisonous, by William C. Bates, Boston.

The lectures and discussions are printed in the Transactions of the Society.

The sum of $8,050 was appropriated for Prizes and Gratuities for 1896.

The Annual Spring Show was held March 24–27. For a number of years much attention has been given to the cultivation of the cyclamen. On a large table at the entrance of the upper hall was the largest and finest show of cyclamens ever seen in Horticultural Hall. The display of spring flowering bulbs, such as fragrant hyacinths, lilies of the valley, narcissuses, jonquils, and tulips was very fine. Notable among pot plants were *Acacia pubescens* and *A. Drummondii.* A fine specimen of the new hardy climbing rose, Crimson Rambler, with nearly two hundred flowers, in fine condition, attracted much attention. The show of cinerarias, roses, carnations, pansies, and violets was very fine. There was a good display of early vegetables, and winter apples and pears.

The Rose and Strawberry Show was held June 23 and 24. The upper hall was devoted to a fine display of roses and large collections of orchids and other flowering plants. In the lower hall about two hundred baskets of strawberries were exhibited. The six baskets of Marshall, four quarts each, on a table near the entrance were the centre of attraction. All the standard varieties and many new seedlings were shown. There was a fine show of hothouse grapes, some bunches weighing nearly seven pounds each. The show of early vegetables was not large, but was very fine.

The Annual Plant and Flower Show opened September 2 for two days. The lower hall was devoted to cut flowers. A raised bank on the platform at the rear of the hall was covered with over twelve hundred dahlias, comprising all sizes and colors and perfect in form. Four long tables were covered with a great variety of cut flowers, including asters, phlox, dianthus, zinnias, and French cannas, with large collections of wild flowers. Pot plants were shown in the upper hall. There were large and fine collections of ferns, palms, crotons, dracænas, fuchsias, and orchids in variety. Several large tanks of aquatic plants were shown. One tank contained twenty-five choice varieties of Nymphæas and Nelumbiums.

The Annual Exhibition of Fruits and Vegetables was held

October 1 and 2. The show of pears was smaller than usual, but apples were abundant. Many fine specimens of apples were shown, but no outdoor peaches and very few plums. Benjamin G. Smith, of Cambridge, one of the oldest members of the Society, celebrated his eightieth birthday, October 1, by exhibiting sixty varieties of hardy native grapes, the largest exhibit ever made by one individual. The show of vegetables was in the lower hall, and included all the standard varieties, which were all well grown and of good quality.

The Annual Chrysanthemum Show opened November 10 and continued four days. The lower hall was filled with cut flowers. Seven large vases were filled with some of the choicest varieties. The tables from the door to the platform were completely filled with a superb display of cut flowers. The upper hall was devoted to the pot plants. In the centre of the hall were fine groups arranged for effect. Palms and other foliage plants were used with the chrysanthemums; the effect was very fine. On one side of the hall were arranged plants in twelve-inch pots that were seven feet broad and five or six feet high, and complete masses of bloom. For large flowers, fine color, and perfect form the Chrysanthemum Show of 1896 has never been equalled.

Respectfully submitted,

George Cruickshanks,
Delegate.

REPORT

OF THE

COMMITTEE ON THE LIBRARY

FOR THE YEAR 1896.

Cultivators continue to send here for exhibition more illustrations of their skill than can be satisfactorily shown in our limited space; and, in the same way, books and pamphlets continue to find their way to the library regardless of the lack of accommodations they find here; but the increase of exhibits and of books is not a matter to be deprecated — still less to be curtailed. The remedy in each case is the same, and we should no more cease to acquire books and pamphlets than we should cease to send plants, flowers, fruits, and vegetables here to delight and instruct the crowds that throng our halls on all special occasions. The exhibitions, the discussions, and the library are three agencies which have taken and will continue to take an equal share in sustaining and extending the renown of the Massachusetts Horticultural Society.

As usual there is but little to say about this department. The work here continues to fully occupy the Librarian and those who are associated with him. The accessions, which will be enumerated as a supplement to the report of the Librarian, have been of the usual number and importance, and those which have been purchased from the income of the Stickney Fund and from the Society's appropriation have exhausted the entire amount as usual. The Card Catalogue of plates will proceed henceforward on a different plan. Mrs. Andrews has retired from her labors, having written cards for nearly every plate which is not in Pritzel's Index, and it is thought that all the cards made neces-

sary by new acquisitions can be prepared by the force regularly employed. It will be desirable to include in it sometime all which we possess that are in Pritzel's Index, but that time is not yet.

Your Committee, believing that the library is an agency of very great value, regret that the fund to which it owes so much of its growth is soon to pass into other hands, and hope that means may be found which will enable it to continue its increase in size and usefulness.

For the Committee,

W. E. Endicott,
Chairman.

REPORT

OF THE

SECRETARY AND LIBRARIAN

FOR THE YEAR 1896.

As Secretary I have to report in regard to the TRANSACTIONS of the Society that the first part for 1896 has been printed and distributed to members and correspondents of the Society. Of the preceding TRANSACTIONS, the List of Library Accessions, which has previously been published in the second part for each year, was, by direction of the Committee on Publication, omitted in 1895, in order not to delay other matter, and will appear later as Part III. of the TRANSACTIONS for that year. This is the most difficult part of the whole, and requires more labor to present it correctly, but it is now nearly ready for the printer. The Schedule of Prizes for 1896 was, as promised, ready at the beginning of the year, — indeed a few days earlier, — and it is expected that that for 1897 will be equally prompt. The various records of the Society and of Committees, and the correspondence, have been kept up, to the best of the ability of those immediately employed on them.

The List of Library Accessions, though not much longer than last year, shows a steady increase. The work of completing sets has been pursued as heretofore. A special effort has been made to procure such publications of the United States Department of Agriculture as we did not already possess. The full list of these publications, received in March, has afforded much assistance in this work; and the result is that we have now 123 bound volumes and 708 pamphlets of that Department, which was established in 1862, and of the Agricultural Reports of the Patent Office which preceded it. This is more than three-fourths of the whole number, and it is intended to continue the work of col-

lecting as opportunity shall offer. Of course, much the greater part of those acquired are from the Department, but material assistance has been derived from the donations of the families of the late Charles M. Hovey and Hon. Marshall P. Wilder, both Ex-Presidents of the Society, and of the New England Historic-Genealogical Society. Some idea of the magnitude of the work of collecting these publications may be formed from the fact that during the year ending June 30, 1896, 376 publications were issued by the Department of Agriculture. The work would be much less but for the great irregularity in the receipt of these publications, necessitating frequent applications for publications to fill gaps; and too often we are informed, though the application is made as soon as the hiatus is discovered, that the edition is exhausted. A most fortunate acquisition is the Conclusion of "Old and Remarkable Trees of Scotland," published by the Highland and Agricultural Society of Scotland, a fragment of which has been on our shelves for thirty years. This interesting little work is now perfected.

Ten volumes of the Silva of North America, by our fellow-member, Charles S. Sargent, have been published, volumes nine and ten having been received during the year now closing. It is seldom that a work of the importance and magnitude of this appears so rapidly and promptly. The Phycotheca Boreali-Americana, a collection of dried specimens of the Algæ of North America, whose leading author, Frank Shipley Collins, is also a member of this Society, has reached its fifth fascicle. The Evolution of Horticulture in New England, by Daniel Denison Slade, another of our members, though smaller, is more generally interesting, and derives additional value from the lamented death of its author soon after its publication. The authors of these three works have all sought and found in this library assistance in their composition.

During the year Parts VIII. and IX. of the Marquess of Lothian's Monograph of the Genus Masdevallia, completing that magnificent work, have been received. The publication of Fitzgerald's Australian Orchids, the first part of which was received by us in 1880, which was interrupted by the death of the author, has been resumed, and it is hoped will be soon completed. The Florilegium Harlemense, with colored plates of the flowers of bulbous rooted plants, has been subscribed for and the first num-

ber has been received, and a copy of its predecessor, the Album Van Eeden, has also been obtained.

It has ever been the purpose of those charged with the selection of books for purchase to acquire all American works suited to this library, and in pursuance of this purpose we secured at an auction sale a copy of the American Flora or History of Plants and Wild Flowers, with colored plates, by A. B. Strong, M.D., published in New York, 1848 to 1851. The first volume of the Illustrated Flora of the Northern United States, Canada and the British Possessions, by Nathaniel Lord Britton, Ph.D., and Hon. Addison Brown, published at New York during the present year, has also been received. In another class of books, L'Horticulteur Français, in twenty-one volumes, with many colored plates, published at Paris from 1851 to 1873, is a valuable acquisition.

The culture of Nuts of various kinds is beginning to attract much attention. Previously to this year we possessed only one or two German books on this subject, but this year we have added one from the Division of Pomology in the United States Department of Agriculture, on Nut Culture in the United States, with colored and plain plates, and the widow of our lamented Corresponding Member, Andrew S. Fuller, has presented a copy of his book, The Nut Culturist, published since his death.

We are indebted to one of our members, Dr. William P. Bolles, for several valuable German works on Medical and Physiological Botany. A Manuscript Journal of horticultural operations, kept in Dorchester from 1822 to 1836, presented by Mrs. J. F. Pratt, is a unique book. It would be interesting to know who was the writer, but the book affords no clew to his name.

The extraordinary interest which has grown up in the last two years in Edible Mushrooms has led to a much more general use of our books on that subject, by members and others, and it is a source of gratification that these inquirers have found the Library so well equipped to meet them. It is to be hoped — and we trust it will be so — that when a similar interest shall be awakened in any other subject connected with the work of the Society, the Library may be found equally well prepared, and that books which may now appear comparatively useless may then be found of the highest value.

In estimating the value of this library it should never be for-

gotten that its chief use is as a reference and not as a circulating library. As there seems to be continual danger of misconception on this point, I take the liberty to repeat what was said on it in a report some years ago: "Statistics of circulation are out of the argument as regards a library whose maintenance ensures the preservation of the best fruits of advanced research, in a repository accessible to scholars and students. As has been well said by competent judges, treating of a 'library for advanced students, or for persons making researches of a learned nature,' — 'the benefit reaped from it by the community cannot be reckoned by any method of statistics. It is by means of such collections as this that some of the greatest benefactors of the public are enabled to prosecute their researches and do their work.'"

The book of Library Wants, for the reception of the names of such books as may be desired by members, which has been kept at the Librarian's desk for nearly twenty years, is still open for the expression of such desires. I regret that it has not received more entries, and hope that hereafter it may be more freely used.

A count of the books, etc., in the Library was made during the summer, which resulted as follows: Books, 9,875; Pamphlets, 6,781; Nursery and Seed Catalogues, 7,273.

I wish here to express my grateful sense of the appreciation by the Library Committee of the difficulties surrounding the work on the Library, and the heartiness with which the Librarian and his assistants have been supported in the discharge of their duties.

Robert Manning,
Librarian.

TREASURER'S REPORT

FOR THE YEAR 1896.

MASSACHUSETTS HORTICULTURAL SOCIETY *in account current to December 31, 1896, with* CHARLES E. RICHARDSON, *Treasurer.*

1896.	DR.		
Dec. 31.	To amount paid on account of the Library in 1896:		
	For books, periodicals, and binding .	$400 00	
	From income of Josiah Stickney Fund for books	684 57	
			$1,084 57
	To amount paid Interest on Funds for Prizes, etc., credited below		1,892 72
	To Prizes awarded in 1895 paid in 1896 as follows:		
	For Plants	$1,981 06	
	" Flowers	2,517 68	
	" Fruits	1,531 53	
	" Vegetables	1,167 00	
	" Gardens and Greenhouses . .	485 00	
	" H. H. Hunnewell Prizes for Rhododendrons	105 00	
	" Special Prize for Palms at Carnation Show	100 00	
			7,887 27
	To amount paid Committee on School Gardens and Children's Herbariums		146 00
	" " Salaries of Secretary, Assistant, and Treasurer . .	$3,600 00	
	" " Salaries of Committees . .	1,008 00	
	" " extra services in Library and on Transactions . . .	657 25	
	" " Committee of Arrangements .	399 90	
	Amounts carried forward	$5,665 15	$11,010 56

Amounts brought forward	$5,665 15	$11,010 56
To amount paid for Insurance . . .	90 20	
" " Repairs	500 50	
" " Furniture and Exhibition Ware	4 50	
" " Heating	526 54	
" " Lighting	849 44	
" " Water Rates . . .	247 40	
" " Publication and Discussion	291 80	
" " Taxes, 1896 . . .	2,580 00	
" " Commission . . .	30 00	
" " Incidentals . . .	702 91	
" " Stationery, Printing, and Postage . . .	2,232 59	
" " Labor	2,739 10	
" paid to Mrs. P. Manning . .	5,500 00	
" " H. H. Hunnewell . .	4,000 00	
" advanced A. P. Loring . . .	2,500 00	
" paid for Legal Services . . .	550 00	
		29,010 13
Total payment		$40,020 69
Balance of Cash, December 31, 1896		6,600 61
		$46,621 30

1896.	Cr.			
Jan. 1.	By Balance of account rendered December 31, 1895			$7,495 35
	By amount received from Building in 1896, viz.:			
	Rent of Stores	$16,834 14		
	" Halls	3,058 34		
			$19,892 48	
	By Income from Mount Auburn		3,682 87	
	" Massachusetts State Bounty		600 00	
	" Annual Exhibitions:			
	Gross receipts	$1,322 75		
	Less expenses	759 66		
			563 09	
	" Admissions and Assessments		1,288 00	
	" Notes Receivable		304 85	
	" Sales of Transactions		7 00	
	" Interest on Bonds	$1,272 50		
	" " Bank Balance	29 59		
	" " other sources	60 00		
			1,362 09	
	" Josiah Stickney Fund for duplicate book		85	
	" H. H. Hunnewell, prize money for 1895		32 00	
	" H. H. Hunnewell		5,000 00	
	" Casualty Insurance Company of St. Louis		4,000 00	
	" Chicago, Burlington, and Quincy R.R. Bond, matured		500 00	
	" Interest credited following Funds charged above:			
	Samuel Appleton Fund	$50 00		
	John A. Lowell Fund	50 00		
	Theodore Lyman Fund	550 00		
	Josiah Bradley Fund	50 00		
	Benjamin V. French Fund	25 00		
	H. H. Hunnewell Fund	200 00		
	William J. Walker Fund	117 72		
	Levi Whitcomb Fund	25 00		
	Benjamin B. Davis Fund	25 00		
	Marshall P. Wilder Fund	50 00		
	Amounts carried forward	$1,142 72	$37,233 23	$7,495 35

Amounts brought forward . . .	$1,142 72	$37,233 23	$7,495 35
J. Lewis Russell Fund .	50 00		
Josiah Stickney Fund, as agreed	700 00		
		1,892 72	
			39,125 95
			$46,621 30

CHARLES E. RICHARDSON,
Treasurer.

H. H. Hunnewell,
Francis H. Appleton,
Augustus Hemenway,
} *Finance Committee.*

ASSETS AND LIABILITIES OF THE MASSACHUSETTS HORTICULTURAL SOCIETY,

DECEMBER 31, 1896.

ASSETS.

Real Estate	$250,000 00	
Stereotype Plates and copies of History	257 00	
Chicago, Burlington & Quincy R.R. Bonds	1,000 00	
Sinking Fund	23,872 50	
Kansas City, Clinton & Springfield R.R. Bonds	1,980 00	
Library	35,897 19	
Furniture and Exhibition Ware	6,993 41	
A. P. Loring, Executor	7,500 00	
Due from Tenants	1,535 46	
Cash	6,600 61	
		$335,636 17

LIABILITIES.

Mortgage		$1,000 00	
H. H. Hunnewell		1,000 00	
Josiah Stickney Fund, payable to Harvard College, 1899		12,000 00	
Prize Funds invested in Building:			
Samuel Appleton Fund,	$1,000 00		
Theodore Lyman "	11,000 00		
John A. Lowell "	1,000 00		
Josiah Bradley "	1,000 00		
Benjamin V. French "	500 00		
H. H. Hunnewell "	3,000 00		
William J. Walker "	2,354 43		
Levi Whitcomb "	500 00		
Benjamin B. Davis "	500 00		
	$20,854 43		
Prize Funds invested in Bonds:			
H. H. Hunnewell Fund	$1,000 00		
Marshall P. Wilder "	1,000 00		
J. Lewis Russell "	1,000 00		
	3,000 00		
		23,854 43	
Prizes for 1896, payable in 1897		8,050 00	
			45,904 43
Surplus			$289,731 74

CHAS. E. RICHARDSON, *Treasurer.*

Membership Account of Massachusetts Horticultural Society, December 31, 1896.

Life Members per last report	563		
Added during 1896	23		
Commuted from Annual	1		
		587	
Deceased		33	
			554
Annual Members per last report	222		
Added during 1896	20		
Reinstated	1		
		243	
Commuted to Life	1		
Deceased	13		
Resigned	6		
Dropped for non-payment for two years	11		
		31	
			212
Present Membership			766

INCOME FROM MEMBERSHIP.

23 new Life Members @ $30	$690 00
20 new Annual Members @ $10	200 00
1 commuted to Life	20 00
Annual Assessments	378 00
	$1,288 00

CHARLES E. RICHARDSON, *Treasurer.*

Dr. *Massachusetts Horticultural Society in account with the Proprietors of the Cemetery of Mt. Auburn.* Cr.

For Sales and Improvements within the Cemetery for the year ending December 31, 1896.

To cost of filling up and improving land at Mount Auburn for the year ending December 31, 1896, the Massachusetts Horticultural Society being charged with their proportion of the same:				By sales in January	$290 00
Birch to Eagle and Cherry Avenues	$230 62			" " February	
Magnolia Avenue and Vinca Path	277 50			" " March	85 00
	$508 12			" " April	1,305 00
				" " May	2,614 60
One-quarter of $508.12 is	$127 03			" " June	3,539 00
Balance due Mass. Horticultural Society	3,682 87			" " July	490 00
		$3,809 90		" " August	3,060 00
				" " September	952 00
				" " October	1,540 00
				" " November	980 00
				" " December	890 00
					$15,745 60
				Net amount received from Receiving Tomb	894 00
					$16,639 60
				Deduct for annual expenses	1,400 00
					$15,239 60
		$3,809 90		Mass. Horticultural Society ¼ part of $15,239.60	$3,809 90

E. & O. E.

H. B. MACKINTOSH, *Treasurer.*

December 31, 1896.

MASSACHUSETTS HORTICULTURAL SOCIETY

To the PROPRIETORS OF THE CEMETERY OF MOUNT AUBURN, *Dr.*

For one-fourth part of the following expenditures, for the grading new lands for sale during the year 1896:

Birch to Eagle and Cherry Avenues.

102½ days, men	$230 62	
		$230 62

Magnolia Avenue and Vinca Path.

74 days, man and horse	$277 50	
		277 50
		$508 12
One-fourth of $508.12 is		$127 03

JAMES C. SCORGIE,
Superintendent of the Cemetery of Mount Auburn.

MOUNT AUBURN, December 31, 1896.

I certify the foregoing to be a true copy of improvements for the year 1896, rendered by the Superintendent.

H. B. MACKINTOSH, *Treasurer.*

Massachusetts Horticultural Society.

OFFICERS AND STANDING COMMITTEES FOR 1897.

President.
FRANCIS H. APPLETON, of Peabody.

Vice-Presidents.
CHARLES H. B. BRECK, of Brighton. WALTER HUNNEWELL, of Wellesley.
AUGUSTUS PARKER, of Roxbury. BENJAMIN P. WARE, of Clifton.

Treasurer and Superintendent of the Building.
CHARLES E. RICHARDSON, of Cambridge.

Secretary and Librarian.
ROBERT MANNING, of Salem.[1]

Professor of Botany and Vegetable Physiology.
BENJAMIN M. WATSON, of Jamaica Plain.

Professor of Entomology.
SAMUEL H. SCUDDER, of Cambridge.

Delegate to the State Board of Agriculture.
E. W. WOOD, of West Newton.

[1] Communications to the Secretary, on the business of the Society, should be addressed to him at Horticultural Hall, Boston.

STANDING COMMITTEES.

Executive.

THE PRESIDENT, FRANCIS H. APPLETON, CHAIRMAN.

THE CHAIRMAN OF THE FINANCE COMMITTEE, H. H. HUNNEWELL, *Ex officio.*

WILLIAM C. STRONG.
WILLIAM H. SPOONER.
NATHANIEL T. KIDDER.
BENJAMIN C. CLARK.
WALTER HUNNEWELL
CHARLES W. PARKER.
CHARLES F. CURTIS.

Finance.

H. HOLLIS HUNNEWELL, OF BOSTON, CHAIRMAN.

FRANCIS H. APPLETON.
AUGUSTUS HEMENWAY.

Lectures and Publication.

J. D. W. FRENCH, OF BOSTON, CHAIRMAN.

BENJAMIN M. WATSON.
NATHANIEL T. KIDDER.

Library.

WILLIAM E. ENDICOTT, OF CANTON, CHAIRMAN.

GEORGE W. HUMPHREY.
EDWIN FAXON.
WALTER S. PARKER.
GEORGE E. DAVENPORT.

Plants.

AZELL C. BOWDITCH, OF SOMERVILLE, CHAIRMAN.

JAMES COMLEY.
JAMES WHEELER.
WILLIAM J. MARTIN.
ARTHUR H. FEWKES.

Flowers.

J. WOODWARD MANNING, OF READING, CHAIRMAN.

MICHAEL H. NORTON.
KENNETH FINLAYSON.
FREDERICK S. DAVIS.
GEORGE E. DAVENPORT.

Fruits.

E. W. WOOD, OF WEST NEWTON, CHAIRMAN.

CHARLES F. CURTIS.
O. B. HADWEN.
WARREN FENNO.
SAMUEL HARTWELL.
J. WILLARD HILL.
SUMNER COOLIDGE.

Vegetables.

CHARLES N. BRACKETT, OF WATERTOWN, CHAIRMAN.

CEPHAS H. BRACKETT.
P. G. HANSON.
VARNUM FROST.
WARREN H. HEUSTIS.
WALTER RUSSELL.
AARON LOW.

Gardens.

JOHN G. BARKER, of Boston, Chairman.

CHAIRMEN OF THE COMMITTEES ON PLANTS, FLOWERS, FRUITS, VEGETABLES, AND ARRANGEMENTS, *Ex officiis*.

HENRY W. WILSON. JACKSON DAWSON.

For Establishing Prizes.

WILLIAM J. STEWART, of Winchester, Chairman.

CHAIRMEN OF THE COMMITTEES ON PLANTS, FLOWERS, FRUITS, VEGETABLES, AND GARDENS, *Ex officiis*.

MRS. P. D. RICHARDS.

Committee of Arrangements.

JOSEPH H. WOODFORD, of Boston, Chairman.

CHAIRMEN OF THE COMMITTEES ON PLANTS, FLOWERS, FRUITS, VEGETABLES, AND GARDENS, *Ex officiis*.

ROBERT FARQUHAR.

MEMBERS FOR LIFE.

Members of the Society and all other persons who may know of deaths, changes in residence, or other circumstances showing that the following list is inaccurate in any particular, will confer a favor by promptly communicating to the Secretary the needed corrections.

Information, or any clew to it, is especially desired in regard to members whose names are marked thus †.

Adams, Luther, Brighton.
Albro, Charles, Taunton.
Alger, Rev. R. F., Becket.
Allen, Hon. Charles H., Lowell.
Ames, Frank M., Canton.
Ames, George, Boston.
Ames, Oakes, 2d, North Easton.
Ames, Preston Adams, Boston.
Amory, Charles, Boston.
Amory, Frederick, Boston.
Andrews, Charles L., Milton.
Andrews, Frank W., Washington, D. C.
Andros, Milton, San Francisco, Cal.
Appleton, Edward, Reading.
Appleton, Francis H., Peabody.
Appleton, William S., Boston.
Ash, John, Pomfret, Conn.
Atkins, Edwin F., Belmont.
Ayling, Isaac, M. D., Brookline.

Bailey, Jason S., West Roxbury.
Bancroft, John C., Boston.
Banfield, Francis L., M. D., Worcester.
Barber, J. Wesley, Newton.
Barnard, James M., Malden.
Barnard, Robert M., Everett.
Barnes, Walter S., Somerville.
Barnes, William H., Boston.
†Barney, Levi C., Boston.
Barratt, James, East Pasadena, Cal.
Barrett, Edwin S., Concord.
Barry, William C., Rochester, N. Y.
Bartlett, Edmund, Newburyport.
Beal, Leander, Boston.
Becker, Frederick C., North Cambridge.
Beckford, Daniel R., Jr., Jamaica Plain.
Beebe, E. Pierson, Boston.
Beebe, Franklin H., Boston.
Beebe, J. Arthur, Boston.
Berry, James, Brookline.
Birchard, Charles, Framingham.
Blake, Francis, Weston.
Blake, Frederick A., Rochdale.
Blakemore, John E., Roslindale.
Blanchard, John W., Dorchester.
Blinn, Richard D., Chicago, Ill.
Bliss, William, Boston.
Boardman, Samuel M., Milton.
Bôcher, Prof. Ferdinand, Cambridge.
Bockus, Charles E., Dorchester.
Bosler, Frank C., Carlisle, Penn.
†Botume, John, Wyoming.
Bowditch, Azell C., Somerville.
Bowditch, Charles P., Jamaica Plain.
Bowditch, James H., Brookline.
Bowditch, Nathaniel I., Framingham.
Bowditch, William E., Roxbury.
Bowker, William H., Boston.

Brackett, Cephas H., Brighton.
Brackett, Charles N., Watertown.
Bresee, Albert, Hubbardton, Vt.
Brewer, Francis W., Hingham.
Brigham, William T., Honolulu, Hawaii.
Brooks, J. Henry, Milton.
Brown, Alfred S., Jamaica Plain.
Brown, Charles E., Yarmouth, N. S.
Brown, Edward J., Weston.
Brown, George Barnard, Brookline.
Brown, George Bruce, Framingham.
Brown, John T., Newburyport.
Bullard, John R., Dedham.
Bullard, William S., Boston.
Burnett, Harry, Southborough.
Burr, Fearing, Hingham.
Burr, Matthew H., Hingham.
Buswell, Edwin W., Brooklyn, N. Y.
Buswell, Frank E., Brooklyn, N. Y.
Butler, Aaron, Wakefield.
Butler, Edward K., Jamaica Plain.

Cabot, Edward C., Brookline.
†Cadness, John, Flushing, N. Y.
Cains, William, South Boston.
Calder, Augustus P., Boston.
Cameron, Robert, Cambridge.
Campbell, Francis, Cambridge.
Capen, John, Boston.
Carlton, Samuel A., Boston.
Carr, Hon. John, Roxbury.
Carter, Charles N., Boston.
Carter, Miss Maria E., Woburn.
Cartwright, George, Dedham.
Chadbourne, Marshall W., Mount Auburn.
Chaffin, John C., Newton.
Chamberlain, Chauncey W., Boston.
Chase, Andrew J., Lynn.
Chase, Daniel E., Somerville.
Chase, George B., Boston.
Chase, William M., Everett.
Cheney, Mrs. Elizabeth S., Wellesley.
Childs, Nathaniel R., Boston.
Choate, Charles F., Southborough.
Christie, William, Newton.
Claflin, Hon. William, Newtonville.
Clapp, Edward B., Dorchester.
Clapp, James H., Dorchester.
Clapp, William C., Dorchester.
Clark, Benjamin C., Boston.
Clark, B. Preston, Cohasset.
Clark, Miss Eleanor J., Pomfret Centre, Conn.
Clark, J. Warren, Rockville.
Clarke, Miss Cora H., Jamaica Plain.
Cleary, Lawrence, West Roxbury.
Clough, Micajah Pratt, Lynn.
Cobb, Albert A., Brookline.
Cobb, John C., Milton.
Coburn, Isaac E., Everett.
Codman, James M., Brookline.
Codman, Ogden, Lincoln.
Collamore, Miss Helen, Boston.
Converse, Elisha S., Malden.
Converse, Parker L., Woburn.
Coolidge, Joshua, Mount Auburn.
Cottle, Henry C., Boston.
Cowing, Walter H., West Roxbury.
Cox, Thomas A., Dorchester.
Coy, Samuel I., Boston.
Crawford, Dr. Sarah M., Roxbury.
Crocker, Miss S. H., Boston.
Crosby, George E., West Medford.
†Crowell, Randall H., Chelsea.
Cummings, Hon. John, Woburn.
Curtis, Charles F., Jamaica Plain.
Curtis, George S., Jamaica Plain.
Cushing, Livingston, Weston.
Cushing, Robert M., Boston.

†Daggett, Henry C., Boston.
Dana, Charles B., Wellesley.
Davenport, Albert M., Watertown.
Davenport, Edward, Dorchester.
Davenport, George E., Medford.
Davenport, Henry, New York.
Davis, John, Lowell.
Dawson, Jackson, Jamaica Plain.
Day, William F., Egypt.
Dee, Thomas W., Mount Auburn.
Denny, Clarence H., Boston.

Denton, Eben, Dorchester.
Dewson, Francis A., Newtonville.
Dexter, F. Gordon, Boston.
Dickerman, George H., Somerville.
Dike, Charles C., Stoneham.
Doliber, Thomas, Brookline.
Donald, William, West Roxbury.
Dorr, George, Dorchester.
Dove, George W. W., Andover.
Dowse, William B. H., West Newton.
Draper, Hon. Eben S., Hopedale.
Dreer, William F., Philadelphia, Pa.
Dunlap, James H., Nashua, N. H.
Durant, William, Boston.
Durfee, George B., Fall River.
Dutcher, Frank J., Hopedale.

Eaton, Horace, Cambridge.
Edgar, William W., Waverly.
Eldredge, H. Fisher, Boston.
†Eldridge, E. H., Roxbury.
Eliot, Charles, Brookline.
Ellicott, Joseph P., Boston.
Elliot, Mrs. John W., Boston.
Elliott, William H., Brighton.
Endicott, William E., Canton.
Endicott, William, Jr., Boston.
Everett, William, Dorchester.
Ewell, Warren, Dorchester.

Fairchild, Charles, Boston.
Falconer, William, Pittsburgh, Pa.
Farlow, Lewis H., Newton.
Farnsworth, Mrs. William, Dedham.
Farquhar, James F. M., Roslindale.
Farquhar, John K. M. L., Roxbury.
Farquhar, Robert, Boston.
Faxon, John, Quincy.
Fewkes, Arthur H., Newton Highlands.
Finlayson, Kenneth, Brookline.
Fisher, David, Montvale.
Fisher, James, Roxbury.
†Fisher, Warren, Roxbury.
Flagg, Augustus, Boston.
Fletcher, George V., Belmont.
Fletcher, John W., Chelsea.
Fletcher, J. Henry, Belmont.
Flint, David B., Boston.
Foster, Francis C., Cambridge.
Fottler, John, Jr., Dorchester.
Fowle, George W., Jamaica Plain.
Fowle, William B., Auburndale.
French, Jonathan, Boston.
French, J. D. Williams, Boston.
French, S. Waldo, Jamaica Plain.
French, W. Clifford, Newton.
Frohock, Roscoe R., Malden.

Galloupe, Charles W., Swampscott.
Galvin, John, Boston.
Gardner, George A., Boston.
Gardner, George P., Boston.
†Gardner, Henry N., Mount Auburn.
Gardner, John L., Brookline.
Gibbs, Wolcott, M.D., Newport, R. I.
Gill, George B., Medford.
Gillard, William, Harrison Square, Dorchester.
Gilmore, E. W., North Easton.
Gilson, F. Howard, Reading.
Glover, Joseph B., Boston.
Goddard, A. Warren, Brookline.
Goddard, Joseph, Sharon.
Goddard, Mrs. Mary T., Newton.
Goodell, L. W., Dwight.
Gorham, James L., Jamaica Plain.
†Gould, Samuel, Boston.
Gowing, Mrs. Clara E., Kendall Green.
Gray, James, Wellesley.
Gregory, Hon. James J. H., Marblehead.
Greig, George, Toronto, Ontario.
Grey, Benjamin, Malden.
Guild, J. Anson, Brookline.

Hadwen, Obadiah B., Worcester.
Hall, Edwin A., Cambridgeport.
Hall, George A., Chelsea.
Hall, George R., M.D., Warren, R. I.
Hall, Lewis, Cambridge.
Hall, William F., Brookline.
Halliday, William H., South Boston.

Hammond, Gardiner G., New London, Conn.
Hammond, George W., Boston.
Hammond, Samuel, Boston.
Hanson, P. G., Woburn.
†Harding, George W., Arlington.
Harding, Louis B., Stamford, Conn.
Hardy, F. D., Cambridgeport.
Harris, Charles, Cambridge.
Harris, Thaddeus William, A. M., Keene, N. H.
Harwood, George Fred, Newton.
Haskell, John C., Lynn.
Hastings, Levi W., Brookline.
Hatch, Mrs. C. S., North Cambridge.
Hatch, Edward, Boston.
Hathaway, Seth W., Marblehead.
Hawken, Mrs. Thomas, Rockland, Me.
†Hazeltine, Hazen, Boston.
Hemenway, Augustus, Canton.
Henshaw, Joseph P. B., Boston.
Hews, Albert H., North Cambridge.
Heywood, Hon. George, Concord.
Hilbourn, A. J., Boston.
Hill, John, Stoneham.
Hittinger, Jacob, Mount Auburn.
Hoar, Samuel, Concord.
Hodgkins, John E., Portsmouth, N. H.
Hoitt, Hon. Charles W., Nashua, N. H.
Hollingsworth, Amor L., Milton.
Hollis, George W., Grantville.
Hollis, John W., Allston.
Holmes, Edward J., Boston.
Holt, Mrs. Stephen A., Winchester.
Horner, Mrs. Charlotte N. S., Georgetown.
Horsford, Miss Kate, Cambridge.
Hovey, Charles H., Pasadena, Cal.
Hovey, Stillman S., Woburn.
Hubbard, Charles T., Weston.
Hubbard, Charles Wells, Weston.
Hubbard, Gardiner G., Washington, D. C.
Hubbard, James C., Everett.
Humphrey, George W., Dedham.
Hunnewell, Arthur, Wellesley.
Hunnewell, Henry Sargent, Wellesley.
Hunnewell, H. Hollis, Wellesley.
Hunnewell, Walter, Wellesley.
Hunt, Dudley F., Reading.
Hunt, Francis W., Melrose.
†Hunt, Franklin, Boston.
Hunt, William H., Concord.
Hyde, James F. C., Newton Highlands.

Jack, John George, Jamaica Plain.
Jackson, Charles L., Cambridge.
Jackson, Robert T., Dorchester.
Janvrin, William S., Revere.
Jeffries, John, Boston.
Jenks, Charles W., Bedford.
Johnson, J. Frank, Boston.
Jones, Jerome, Brookline.
Jose, Edwin H., Cambridgeport.
Joyce, Mrs. E. S., Medford.

Kakas, Edward, West Medford.
Kelly, George B., Jamaica Plain.
Kendall, D. S., Woodstock, Ont.
Kendall, Edward, Cambridgeport.
†Kendall, Joseph R., San Francisco, Cal.
Kendall, Dr. Walter G., Atlantic.
Kendrick, Mrs. H. P., Allston.
Kennedy, George G., M.D., Roxbury.
Kent, John, Brookline.
†Keyes, E. W., Denver, Col.
Keyes, John M., Concord.
Kidder, Charles A., Southborough.
Kidder, Nathaniel T., Milton.
†Kimball, A. P., Boston.
King, Franklin, Dorchester.
Kingman, Abner A., Brookline.
Kingman, C. D., Middleborough.
Kinney, John M., Boston.
Knapp, Walter H., Newtonville.

Lancaster, Charles B., Newton.
Lawrence, Amory A., Boston.

Lawrence, Amos A., Boston.
Lawrence, James, Groton.
Lawrence, John, Groton.
Learned, Charles A., Arlington.
Lee, Charles J., Dorchester.
Lee, Daniel D., Jamaica Plain.
Lee, Francis H., Salem.
Lee, Henry, Boston.
Leeson, Hon. Joseph R., Newton Centre.
Lemme, Frederick, Charlestown.
Leuchars, Robert B., Boston.
Lewis, William G., Framingham.
Lincoln, George, Hingham.
Lincoln, Col. Solomon, Boston.
Little, James L., Brookline.
Lockwood, Rhodes, Boston.
Lodge, Richard W., Swampscott.
Loftus, John P., Dorchester.
Loring, Caleb W., Beverly Farms.
Lothrop, William S. H., Boston.
Lovett, George L., West Newton.
†Lowder, John, Watertown.
Lowell, Augustus, Boston.
Luke, Elijah H., Cambridgeport.
Lumb, William, Boston.
Lunt, William W., Hingham.
Lyman, George H., Wareham.
Lyman, Col. Theodore, Brookline.
Lyon, Henry, M. D., Charlestown.

†Mahoney, John, Boston.
Mallet, E. B., Jr., Freeport, Maine.
Mann, James F., Ipswich.
Manning, Jacob W., Reading.
Manning, Mrs. Lydia B., Reading.
Manning, Robert, Salem.
Manning, Warren H., Brookline.
Marshall, Frederick F., Chelsea.
Mason, Col. Frederick, Taunton.
Matthews, Nathan, Boston.
McCarty, Timothy, Providence, R.I.
McClure, John, Revere.
McWilliam, George, Whitinsville.
Melvin, James C., West Newton.
Merriam, Herbert, Weston.
Merriam, M. H., Lexington.
Merrifield, William T., Worcester.
Merrill, Hon. Moody, Roxbury.
Metivier, James, Cambridge.
Milmore, Mrs. Joseph, Washington, D. C.
Minton, James, Boston.
Mitton, Edward J., Brookline.
Mixter, George, Boston.
Monteith, David, Dedham.
Montgomery, Alexander, Natick.
Moore, John H., Concord.
†Morse, Samuel F., Boston.
Moseley, Charles H., Dorchester.
Mudge, George A., Portsmouth, N. H.
Murphy, William Bowen, Boston.

Nevins, David, Framingham.
Newman, John R., Winchester.
Newton, Rev. William W., Pittsfield.
Nickerson, George A., Dedham.
Norton, Charles W., Allston.
Norton, Edward E., Boston.

Oakman, Hiram A., North Marshfield.
Olmsted, John Charles, Brookline.

Packer, Charles H., Boston.
Paige, Clifton H , Mattapan.
Paige, John C., Boston.
Palmer, Julius A., Jr., Boston.
Parker, Augustus, Roxbury.
Parker, Charles W., Boston.
Partridge, Horace, North Cambridge.
Paul, Alfred W., Dighton.
Peabody, Francis H., Boston.
Peabody, John E., Boston.
Peck, O. H., Denver, Col.
Peck, William G., Arlington.
Peirce, Silas, Boston.
Perkins, Edward N., Jamaica Plain.
†Perry, George W., Malden.
Philbrick, William D., Newton Centre.
Pierce, Dean, Brookline.
Pierce, George Francis, Dorchester.

Poor, John R., Boston.
Porter, James C., Wollaston.
Potter, Joseph S., Fredericksburg, Va.
Prang, Louis, Roxbury.
Pratt, Laban, Dorchester.
Pratt, Lucius G., West Newton.
Pratt, Robert M., Boston.
Pratt, William, Winchester.
Pray, Dr. Mark W., Boston.
†Prescott, Eben C., New York.
Prescott, William G., Quincy.
Pringle, Cyrus G., Charlotte, Vt.
Prouty, Gardner, Littleton.
Putnam, Joshua H , Newton Centre.

Quinby, Hosea M., M.D., Worcester.

Raddin, Everett W., North Cambridge.
Rand, Miss Elizabeth L., Newton Highlands.
Rand, Harry S., North Cambridge.
Rand, Oliver J., Cambridgeport.
Rawson, Warren W., Arlington.
Ray, James F., Franklin.
Ray, Hon. James P., Franklin.
Ray, Hon. Joseph G., Franklin.
Raymond, Walter, Boston.
Read, Charles A., Manchester.
Reardon, John B., Boston.
Reed, George W., Boston.
Rice, George C., Worcester.
Richards, John J., Boston.
Richardson, Charles E., Cambridge.
Rinn, J. Ph., Boston.
Ripley, Charles, Dorchester.
Ripley, Ebed L., Hingham Centre.
Robbins, I. Gilbert, Melrose Highlands.
Robinson, John, Salem.
Robinson, Joseph B., Allston.
Robinson, Warren J., Somerville.
Ross, Henry, Newtonville.
Ross, Waldo O., Boston.
Ruddick, William H., M. D., South Boston.
Russell, George, Woburn.
Russell, Hon. John E., Leicester.
Russell, Walter, Arlington.

Salisbury, William C. G., Boston.
Sanford, Oliver S., Hyde Park.
Sargent, Charles S., Brookline.
Saville, Richard L., Brookline.
Sawtelle, Eli A., Boston.
Sawyer, Timothy T., Boston.
Scorgie, James C., Cambridge.
†Scott, Charles, Newton.
Sears, Miss Clara E., Boston.
Sears, J. Montgomery, Boston.
Shaw, Christopher C., Milford, N. H.
Shorey, John L., Lynn.
Shuman, Hon. A., Roxbury.
Siebrecht, H. A., New Rochelle, N. Y.
Simpkins, Hon. John, Yarmouthport.
Skinner, Francis, Boston.
Smith, Benjamin G., Cambridge.
Smith, Calvin W., Wellesley Hills.
Smith, Charles H., Jamaica Plain.
Smith, Charles S., Lincoln.
Smith, Edward N., San Francisco, Cal.
Smith, George O., Boston.
Smith, Thomas Page, Waltham.
Snow, Eugene A., Melrose.
Snow, Miss Salome H., Brunswick, Me.
Spaulding, Edward, West Newton.
Speare, Alden, Newton Centre.
Spooner, William H., Jamaica Plain.
Sprague, Hon. Charles F., Brookline.
Springall, George, Malden.
Stearns, Frank W., Newton.
Stedman, Henry R., M. D., Roslindale.
Stewart, William J., Winchester.
Stone, Charles W., Boston.
Stone, Prof. George E., Amherst.
Stone, George F., Chestnut Hill.
Strater, Herman, Roxbury.
Strong, William C., Waban.
Sturgis, Russell, Manchester.
Sturtevant, E. Lewis, M. D., South Framingham.

Surette, Louis A., Concord.
Swain, Charles E., Roxbury.
Sweet, Everell F., Malden.

Taft, John B., Cambridge.
Talbot, Mrs. I. Tisdale, Boston.
Tarbell, George G., M. D., Boston.
Taylor, Horace B., Portland, Me.
Temple, Felker L., Boston.
Tenney, C. H., Methuen.
Thompson, Leonard, Woburn.
Thurlow, Thomas C., West Newbury.
Tilton, Stephen W., Roxbury.
Todd, John, Hingham.
Tolman, Benjamin, Concord.
Toppan, Roland W., Malden.
Torrey, Everett, Charlestown.
Trepess, Samuel J., Spokane, Wash.
†Turner, John M., Dorchester.
Turner, Roswell W., Boston.

Underwood, William J., Belmont.

Vander-Woerd, Charles, Waltham.
Vinal, Miss Mary L., Somerville.

Wainwright, William L., Braintree.
Wakefield, E. H., Cambridge.
Walcott, Henry P., M.D., Cambridge.
Waldo, C. Sidney, Jamaica Plain.
Wales, George O., Braintree.
Walker, Edward C. R., Roxbury.
Walker, Miss Mary S., Waltham.
Walley, Mrs. W. P., Boston.
Walton, Daniel G., Wakefield.
Ward, Francis Jackson, Roxbury.
Ward, John, Newton Centre.
Ware, Benjamin P., Clifton.
Ware, Miss Mary L., Boston.
Washburn, Andrew, Hyde Park.
Watson, Benjamin M., Jamaica Plain.
Watson, Thomas A., East Braintree.
Watts, Isaac, Waverly.
Webber, Aaron D., Boston.
Weld, Christopher Minot, Jamaica Plain.
Weld, George W., Newport, R. I.
Weld, Otis E., Boston.
Weld, Richard H., Boston.
West, Mrs. Maria L., Neponset.
Weston, Leonard W., Lincoln.
Weston, Seth, Revere.
Wheeler, Frank, Concord.
Wheelwright, A. C., Brookline.
Whitcomb, William B., Medford.
White, Francis A., Brookline.
White, Joseph H., Brookline.
Whitney, Arthur E., Winchester.
Whitney, Ellerton P., Milton.
Whitten, Charles V., Dorchester.
Whittier, Hon. Charles, Roxbury.
Whittier, George E., Groton.
Wilbur, George B., West Newton.
Wilder, Edward Baker, Dorchester.
Wilder, Henry A., Malden.
Willard, E. W., Newport, R. I.
Willcutt, Levi L., West Roxbury.
Williams, Aaron D., Boston.
Williams, Benjamin B., Boston.
Williams, Philander, Taunton.
Willis, George W., Chelsea.
Willis, Joshua C., Roxbury.
Wilson, Col. Henry W., Boston.
Wilson, William Power, Boston.
Winthrop, Robert C., Jr., Boston.
Wood, William K., West Newton.
Woods, Henry, Boston.
Wright, George C., West Acton.
Wyman, Oliver B., Shrewsbury.

ANNUAL MEMBERS.

Members of the Society and all other persons who may know of deaths, changes of residence, or other circumstances showing that the following list is inaccurate in any particular, will confer a favor by promptly communicating to the Secretary the needed corrections.

Abbott, Samuel L., M. D., Boston.
Allen, Charles L., Floral Park, N. Y.
Alles, William H., Hyde Park.
Anderson, George M., Milton.
Arnold, Mrs. Anna E., Roxbury.
Atkinson, Edward, Brookline.

Badlam, William H., Dorchester.
Barker, John G., Boston.
Benedict, Washington G., Boston.
Bigelow, Arthur J., Eastlake, Worcester.
Bigelow, Mrs. Nancy J., Southborough.
Bird, John L., Dorchester.
Bird, Mrs. Sarah Elizabeth, Roxbury.
Bliss, Benjamin K., East Bridgewater.
Bock, William A., North Cambridge.
Bolles, Matthew, Boston.
Bolles, William P., M. D., Roxbury.
Bouvé, Lander M., Brookline.
Boyden, Clarence F., Taunton.
Breck, Charles H., Newton.
Breck, Charles H. B., Brighton.
Brooks, George, Brookline.
Brown, David H., West Medford.
Butler, Edward, Wellesley.

Carpenter, Frank O., West Roxbury.
Carroll, James T., Chelsea.
Carter, Mrs. Sarah D. J., Wilmington.
Chase, Joseph S., Malden.
Chase, Leverett M., Roxbury.
Chase, Philip A., Lynn.
Cheney, Amos P., Natick.
Chubbuck, Isaac Y., Roxbury.
Clapp, Henry L., Roxbury.
Clark, John Spencer, Boston.
Clark, Joseph, Manchester.
Clark, Theodore M., Newtonville.
Clarke, Frederick E., Lawrence.
Collins, Frank S., Malden.
Comley, James, Lexington.
Coolidge, David H., Jr., Boston.
Coolidge, Sumner, Mount Auburn.
Cotter, Lawrence, Dorchester.
Cotting, Charles U., Boston.
Councilman, Prof. W. T., Boston.
Crosby, J. Allen, Jamaica Plain
Curtis, Joseph H., Boston.
Curtis, Louville, Tyngsborough.

Davis, Frederick, Boston.
Davis, Frederick S., West Roxbury.
Davis, Thomas M., Cambridgeport.
Dawson, Charles Jackson, Jamaica Plain.
Dimick, Orlendo W., Watertown.
Dolbear, Mrs. Alice J., College Hill.
Doran, Enoch E., Brookline.
Doyle, William E., East Cambridge.
Duffley, Daniel, Brookline.

Eaton, Warren E., Reading.

Endicott, Miss Charlotte M., Canton.
Ewell, Marshall F., Marshfield Hills.

Faxon, Edwin, Jamaica Plain.
Felton, Arthur W., West Newton.
Fenno, Warren, Revere.
Fisher, Sewall, Framingham.
Fitzgerald, Desmond, Brookline.
Fletcher, Fred W., Auburndale.
Forbes, William H., Jamaica Plain.
French, Charles G., Utica, N. Y.
Frost, Artemas, Belmont.
Frost, George, West Newton.
Frost, Varnum, Arlington.
Fuller, T. Otis, Needham.

Gibbon, Mrs. James A., Brookline.
Gill, Mrs. E. M., Medford.
Gilman, Hon. Virgil C., Nashua, N. H.
Grant, Charles E., Concord.
Grew, Henry Sturgis, Boston.

Hall, Charles H., M. D., Boston.
Hall, Stacy, Boston.
Hall, William T., Revere.
Hallstram, Charles W., Boston.
Hargraves, William J., Jamaica Plain.
Harris, Miss Ellen M., Jamaica Plain.
Harris, Frederick L., Wellesley.
Harrison, Thomas, Melrose Highlands.
Hartwell, Samuel, Lincoln.
Hatfield, T. D., Wellesley.
Henshaw, Samuel, West Brighton, N. Y.
Hersey, Alfred H., Hingham.
Hersey, Edmund, Hingham.
Heustis, Warren H., Belmont.
Hewett, Miss Mary C., Canton.
Hill, J. Willard, Belmont.
Hobbs, George M., Boston.
Hollis, George, South Weymouth.
Horton, Herbert A., Brookline.
Houghton, George S., West Newton.
Howard, J. W., Somerville.
Hubbard, F. Tracey, Cambridge.
Huston, Miss Katherine W., Roxbury.

Ireland, Robert D., Winthrop.

James, Robert Kent, Dorchester.
Jameson, G. W., East Lexington.

Keith, Miss Mary R., Washington, D. C.
Kemp, William S., Brookline.
Kenrick, Miss Anna C., Newton.

Lancaster, Mrs. E. M., Roxbury.
Lawrence, Henry S., Roxbury.
Lee, William W., Northampton.
Lincoln, Miss Agnes W., Medford.
Lomax, George H., Somerville.
Lombard, Richard T., Wayland.
Loring, Charles G., Boston.
Loring, John A., North Andover.
Loring, William C., Beverly.
Lothrop, Thornton K., Boston.
Loud, Miss Mary E., Roxbury.
Low, Hon. Aaron, Hingham.
Lowell, John, Newton.

Manda, W. A., South Orange, N. J.
Manning, A. Chandler, Reading.
Manning, J. Woodward, Reading.
Martin, William J., Milton.
Masten, Cornelius E., Roxbury.
May, F. W. G., Boston.
McDowell, Mrs. Mary, Cambridge.
McLaren, Anthony, Forest Hills.
McMullen, Edgar, Boston.
Meriam, Horatio C., D.M.D., Salem.
Merrill, John J., Roxbury.
Milman, William, Roxbury.
Moore, George D., Arlington.
Moseley, Frederick Strong, West Newbury.
Munson, Prof. W. M., Orono, Me.

Newton, John F., Roxbury.
Nicholson, William, Framingham.

Norton, Michael H., Boston.
Norton, Patrick, Boston.

Olmsted, Frederick Law, Brookline.

Park, William D., Boston.
Park, William P., West Boxford.
Parker, John, Newtonville.
Parker, Walter S., Reading.
Patterson, William, Quincy.
Peirce, George H., Concord.
Peterson, Ellis, Jr., Jamaica Plain.
Petremant, Robert, New York, N. Y.
Pickman, Dudley L., Boston.
Pigott, Thomas E., Winthrop.
Plimpton, Willard P., West Newton.
Power, Charles J., South Framingham.
Prichard, Joseph V., Dorchester.
Purdie, George A., Wellesley Hills.

Rich, Miss Ruth G., Dorchester.
Rich, William E. C., Roxbury.
Rich, William P., Chelsea.
Richards, Mrs. P. D., West Medford.
Robbins, Oliver R., Weston.
Robinson, Walter A., Arlington.
Ross, Charles W., Newtonville.
Ross, Henry Wilson, Newtonville.
Rothwell, James E., Brookline.

Saunders, Miss Mary T., Salem.
Sawtelle, J. M., Fitchburg.
Schmitt, Georg A., Boston.
Scott, Augustus E., Lexington.
Scudder, Samuel H., Cambridge.
Searles, E. F., Methuen.
Seaver, Edwin P., LL. D., Waban.
Sharples, Stephen P., Cambridge.
Shaw, Hon. Edward P., Newburyport.
Sheppard, Edwin, Lowell.
Smith, Archibald, Somerville.
Souther, Charles H., Jamaica Plain.
Southworth, Edward, Quincy.
Squire, Miss Esther A., North Cambridge.
Stearns, Mrs. Charles A., East Watertown.
Stearns, Charles H., Brookline.
Stevens, Miss Mary O., North Andover.
Stone, Joshua C., Watertown.
Storer, Charles, Providence, R. I.
Story, Miss Sarah W., Brighton.
Swan, Charles W., M. D., Boston.

Tailby, Joseph, Wellesley.
Talbot, Josiah W., Norwood.
Teele, William H., West Acton.
Terry, Rev. Calvin, North Weymouth.
Toby, Rufus T., Roxbury.
Travis, Charles B., Brighton.
Tyndale, Theodore H., Brookline.

Vaughan, J. C., Chicago, Ill.

Walsh, Michael H., Wood's Holl.
Warren, Samuel H., Weston.
Webster, Hollis, Cambridge.
Welch, Patrick, Dorchester.
Weld, Charles E., Roslindale.
Wells, Benjamin T., Newtonville.
Westwood, Thomas H., Jamaica Plain.
Wheeler, James, Brookline.
White, Maurice P., Roxbury.
White, W. Henry, Lowell.
Whitney, Joseph, Cambridgeport.
Whiton, Hon. Starkes, Hingham Centre.
Wilcox, George D., M. D., Providence, R. I.
Winter, William C., Mansfield.
Wolcott, Mrs. Henrietta L. T., Dedham.
Wood, Mrs. Anna D., West Newton.
Wood, Elijah A., West Newton.
Wood, E. W., West Newton.
Woodford, Joseph H., Boston.
Woods, Henry F., Boston.
Worthington, Roland, Roxbury.

Young, Arthur W., Hingham.
Young, Charles S., Newton Centre.
Young, E. Bentley, Boston.

Zirngiebel, Denys, Needham.

EXTRACTS FROM THE CONSTITUTION AND BY-LAWS.

SECTION XXII.

Life Members.

The payment of thirty dollars shall constitute a Life Membership, and exempt the member from all future assessments, and any annual member, having paid all dues, may become a Life Member by the payment of twenty dollars in addition thereto.

Annual Membership.

Every annual member, before he receives his diploma, or exercises the privileges of a member, shall pay the sum of ten dollars as an admission fee, and shall be subject afterwards to an annual assessment of two dollars.

SECTION XXIII.

Withdrawal or Discontinuance of Membership.

Any member may withdraw from the Society, on giving notice to the Treasurer and paying the amount due from him. Any member who shall neglect for the space of two years to pay his annual assessment, after due notice from the Treasurer, shall cease to be a member. The Treasurer shall give notice of such withdrawals or discontinuances to the Secretary, who shall erase such members' names from the list.

The attention of Annual Members is particularly called to Section XXIII.

HONORARY MEMBERS.

Members and correspondents of the Society and all other persons who may know of deaths, changes of residence, or other circumstances showing that the following list is inaccurate in any particular, will confer a favor by promptly communicating to the Secretary the needed corrections.

Information, or any clew to it, is especially desired in regard to Joseph Maxwell, *elected in* 1830, *and* George W. Smith, *elected in* 1851.

Hon. George S. Boutwell, Groton.
H. W. S. Cleveland, Chicago, Ill.
Hon. Joseph S. Fay, Wood's Holl.
Joseph Jefferson, Buzzard's Bay.
Major L. A. Huguet-Latour, M. P., Montreal, Canada.
Col. Theodore Lyman, Brookline.
Joseph Maxwell, Rio Janeiro, Brazil.
Donald G. Mitchell, New Haven, Conn.
Hon. J. Sterling Morton, Secretary of Agriculture, Washington, D. C.
Baron R. Von Osten Sacken, Heidelberg, Germany.
Samuel B. Parsons, Flushing, N. Y.
Samuel R. Payson, Boston.
George W. Smith, Boston.

CORRESPONDING MEMBERS.

Members and correspondents of the Society and all other persons who may know of deaths, changes of residence, or other circumstances showing that the following list is inaccurate in any particular, will confer a favor by promptly reporting to the Secretary the needed corrections.

Information, or any clew to it, is especially desired in regard to Alexander Burton, *elected in* 1829, S. Reynolds, M. D., 1832, *and* Francis Summerest (or Summerer), 1833.

Édouard André, Editor in Chief of the Revue Horticole, Paris, France.

Professor L. H. Bailey, Cornell University, Ithaca, N. Y.

Charles Baltet, Président de la Société Horticole, Vigneronne, et Forestière de l'Aube, Troyes, France.

Napoleon Baumann, Bolwiller, Alsace.

D. W. Beadle, 303 Crawford St., Toronto, Ontario.

Professor William J. Beal, Agricultural College, Michigan.

Prosper J. Berckmans, President of the American Pomological Society, Augusta, Ga.

Charles E. Bessey, Ph.D., Professor of Botany in the Industrial College of the University of Nebraska, Lincoln.

Dr. Ch. Bolle, Berlin, Prussia.

John Croumbie Brown, LL.D., Haddington, Scotland.

Professor J. L. Budd, Secretary of the Iowa Horticultural Society, Ames.

William Bull, Chelsea, England.

Alexander Burton, United States Consul at Cadiz, Spain, Philadelphia.

Isidor Bush, Bushberg, Jefferson Co., Mo.

George W. Campbell, Ex-President of the Ohio State Horticultural Society, Delaware, O.

Maxime Cornu, Director of the Jardin des Plantes, Paris, France.

Benjamin E. Cotting, M. D., Boston.

Daniel T. Curtis, Dorchester.

Rev. H. Honywood D'Ombrain, Westwell Vicarage, Ashford, Kent, England.

Robert Douglas, Waukegan, Ill.

Malcolm Dunn, Dalkeith, Scotland.

W. T. Thiselton Dyer, C. M. G., F. R. S., Director of the Royal Botanic Gardens, Kew, England.

Parker Earle, President of the American Horticultural Society, Cobden, Ill.

George Ellwanger, Rochester, N. Y.

Henry John Elwes, F. L. S., F. Z. S., Colesborn, Andoversford, Gloucestershire, England.

William G. Farlow, M. D., Professor of Cryptogamic Botany, Harvard University, Cambridge.

B. E. Fernow, Chief of the Division of Forestry, Department of Agriculture, Washington, D. C.

Hon. Robert W. Furnas, Ex-President of the Nebraska State Horticultural Society, Brownville.

Charles A. Goessmann, Ph. D., LL. D., Chemist of the Hatch Experiment Station of the Massachusetts Agricultural College, Amherst.

George L. Goodale, M. D., Professor of Botany, Harvard University, Cambridge.

Obadiah B. Hadwen, President of the Worcester County Horticultural Society, Worcester.

Professor Byron D. Halsted, Botanist and Horticulturist at the New Jersey Agricultural Experiment Station, New Brunswick, N. J.

J. H. Hart, Superintendent of the Botanic Garden, Trinidad.

Dr. F. M. Hexamer, Editor American Agriculturist, New York.

Robert Hogg, LL. D., Editor of the Journal of Horticulture, London.

J. C. Holding, Ex-Treasurer and Secretary of the Cape of Good Hope Agricultural Society, Cape Town, Africa.

Rev. S. Reynolds Hole, Rochester, England.

Sir Joseph Hooker, K. C. S. I., The Camp, Sunningdale, England.

Josiah Hoopes, West Chester, Pa.

George Husmann, Napa, Cal.

William J. Johnson, M. D., Fort Gaines, Ga.

Charles Joly, Vice-President of the Société Nationale d'Horticulture de France, Paris.

Dr. George King, Superintendent of the Royal Botanic Garden, Calcutta.

Professor William R. Lazenby, Secretary of the Agricultural Experiment Station, Columbus, O.

Max Leichtlin, Baden-Baden, Germany.

G. F. B. Leighton, President of the Norfolk Horticultural and Pomological Society, Norfolk, Va.

Victor Lemoine, Nancy, France.

J. Linden, Ghent, Belgium.

T. T. Lyon, President of the Michigan Horticultural Society, South Haven.

Dr. P. MacOwan, Director of the Botanic Garden, Cape Town, Africa.

Dr. Maxwell T. Masters, Editor of the Gardeners' Chronicle, London.

George Maw, Benthal, Kinley, Surrey, England.

T. C. Maxwell, Geneva, N. Y.

Thomas Meehan, Germantown, Pa.

Dr. Charles Mohr, Mobile, Ala.

Dr. Daniel Morris, C. M. G., D. Sc., M. A., F. L. S., Assistant Director of the Royal Botanic Gardens, Kew, England.

Ch. Naudin, Antibes, France.

George Nicholson, Curator of the Royal Botanic Gardens, Kew, England.

William Paul, Waltham Cross, London, N.

Professor D. P. Penhallow, Director of the Botanic Garden, Montreal, Canada.

Henry Probasco, Cincinnati, O.

P. T. Quinn, Newark, N. J.

Cavalière Enrico Ragusa, Palermo, Sicily.

D. Redmond, Ocean Springs, Miss.

S. Reynolds, M. D., Schenectady, N. Y.

William Robinson, Editor of The Garden, London.

Edgar Sanders, Chicago, Ill.

William Saunders, Department of Agriculture, Washington, D. C.

William R. Smith, Curator of the Botanic Garden, Washington, D. C.

Robert W. Starr, Port William, N. S.

Dr. Joseph Stayman, Leavenworth, Kan.

William A. Stiles, Editor of Garden and Forest, Deckertown, N. J.

William Sumner, Pomaria, S. C.

Francis Summerest.

William Trelease, Director of the Missouri Botanic Garden, St. Louis.

Dr. Melchior Treub, Director of the Botanic Garden, Buitenzorg, Java.

H. J. Veitch, Chelsea, England.

Henry L. de Vilmorin, Secretary of the Société Nationale d'Agriculture de France, Paris.

PAGE

REPORT OF COMMITTEE ON GARDENS; Introduction, p. 282; David Nevins's Estate, 282–285; Chrysanthemums, 286; Mrs. Benjamin P. Cheney's Chrysanthemums, 286, 287; Walter Hunnewell's Chrysanthemums, 288, 289; William Nicholson's Chrysanthemums, 289, 290; James Comley's Chrysanthemums, 290–292; Violets, 292, 293; David Nevins's Violets, 293, 294; James Comley's Violets, 294; Carnations, 294, 295; Fruit Garden, 295; Vegetable Gardens, 295; Statement of E. C. Lewis, 296, 297; Warren H. Heustis's Vegetable Garden, 297; Bussey Institution, 297–300; Camellia House at Oakmont, 300–302; William Nicholson's Forced Tomatoes, 302; Winter Forcing of Tomatoes, 303, 304; Awards 304, 305

REPORT OF THE COMMITTEE ON ARRANGEMENTS 306, 307

REPORT OF THE COMMITTEE ON SCHOOL GARDENS AND CHILDREN'S HERBARIUMS; George Putnam School, Roxbury, pp. 308–310; Children's Herbariums, 311–313; Financial Statement, 313; Prizes and Gratuities awarded, 314, 315

REPORT TO THE STATE BOARD OF AGRICULTURE 316–318

REPORT OF THE COMMITTEE ON THE LIBRARY 319, 320

REPORT OF SECRETARY AND LIBRARIAN 321–324

REPORT OF TREASURER AND FINANCE COMMITTEE 325–330

MOUNT AUBURN CEMETERY 331, 332

OFFICERS AND STANDING COMMITTEES FOR 1897 333–335

MEMBERS OF THE SOCIETY; Life, pp. 336–342; Annual, 343–345; Honorary, 347; Corresponding 348–350

EXTRACTS FROM THE CONSTITUTION AND BY-LAWS 346

CONTENTS.

PAGE

BUSINESS MEETING, May 2, 1896; Memorial of C. M. Atkinson, pp. 191, 192; Four members elected 192

BUSINESS MEETING, June 6; No quorum 193

BUSINESS MEETING, July 11; Decease of M. Léon Say and Andrew S. Fuller announced, p. 193; Letter from Mrs. C. M. Atkinson, 193; Vote concerning compensation of committees, 193; Four members elected 193

BUSINESS MEETING, August 1; Nominating Committee appointed . . . 194

BUSINESS MEETING, September 5; Report of Nominating Committee made . 194

BUSINESS MEETING, October 3; Annual Election, pp. 195, 196, 197; Report on compensation of committees, 195; Decease of William Robinson announced, 196; Seventeen members elected 196

BUSINESS MEETING, November 7; Memorial of A. S. Fuller, pp. 197, 198; Memorial of William Robinson, 198, 199; Appropriations for 1897, 200; Labelling Fungi, 200, 201; Two members elected 201

BUSINESS MEETING, December 5; Reports of Committee of Arrangements, Library, Establishing Prizes, presented, p. 201; Partial report from Committee on Gardens and Flowers, 201; Decease of S. G. Damon announced, 202; Letter concerning appointment of Secretary of Agriculture, 202; Seven members elected 202

BUSINESS MEETING, December 12; Reports of Committees on Fruits, Flowers, Gardens, and School Gardens and Children's Herbariums, presented, pp. 202, 203; Report of Secretary and Librarian read, 203; Vote concerning warrants for service on committees 203

REPORT OF COMMITTEE ON PLANTS; Introduction, p. 204; Spring Exhibition, 204, 205; May Exhibition, 205; Rose and Strawberry Exhibition, 205, 206; Annual Exhibition of Plants and Flowers, 206; Chrysanthemum Show, 206, 207; Financial Statement, 207; Prizes and Gratuities awarded, 208–216

REPORT OF COMMITTEE ON FLOWERS; Introduction, pp. 217, 218; Spring Exhibition, 218, 219; May Exhibition, 219, 220; Rhododendron Show, 220; Rose and Strawberry Exhibition, 221; Annual Exhibition of Plants and Flowers, 223, 224; Chrysanthemum Show, 224, 225; Saturday Exhibitions, 217, 218, 219, 220, 221, 222, 223, 224, 225; Financial Statement, 226; Prizes and Gratuities awarded 227–245

REPORT OF COMMITTEE ON FRUITS, pp. 246–248; Prizes and Gratuities awarded . 249–263

REPORT OF COMMITTEE ON VEGETABLES, pp. 264–266; Prizes and Gratuities awarded 267–281

EXPERIMENT STATION REPORTS WANTED.

The Massachusetts Horticultural Society is endeavoring to collect complete sets of the Bulletins and other publications of all the Agricultural Experiment Stations in the United States and Canada. Those named below are wanting, and any person having a spare copy will confer a favor by addressing the Librarian of the Society, Horticultural Hall, No. 101 Tremont Street, Boston.

Alabama (Ag. and Mech. College Station). — Bulletins 4–6 (1884), 7–10 and 1–4 (1885), 5–9 (1886). 7th Annual Report, for 1894.

Alabama (Canebrake Station). — All Annual Reports later than the 3d, for 1890.

Arizona. — 4th Annual Report, for 1893.

Arkansas. — Bulletin 1. All Annual Reports later than the 4th, for 1891.

California. — Bulletins 32, 1878, and 1, 2, 3, 5, and 50, New Series.

Colorado. — Bulletins 3 and 36.

Connecticut (New Haven Station). — Bulletins 1 to 67, inclusive. Annual Reports for 1877 to 1883, inclusive, except that for 1878.

Idaho. — All Bulletins later than No. 9.

Indiana (Purdue Univ. School of Ag.). — Bulletin 1. College Reports 1 to 14, inclusive.

Kentucky. — Bulletin 10.

Maryland. — Special Bulletins G and K.

Michigan. — 6th Annual Report, for 1892–93. (Contained in Report of Michigan Board of Agriculture, 1893.)

Missouri. — Bulletins 9, 13, 15, 16, 19, 20, 25, 26, and 33 of Old Series. All Annual Reports since the 1st, for 1888.

New Jersey. — Bulletins 1, 4, 5, 15, 27, and 28.

New York (Cornell). — Annual Report, 1882–83 (Report of Agricultural Department of Cornell University).

North Carolina. — Bulletins 1 to 56, inclusive, and 69, 2d ed. Meteorological Division, Bulletin 2 (68*b*), and 2d and 3d Annual Reports, for 1888 and 1889. Special Bulletins 1 (77*a*) and 4 (82*a*). Weekly Weather Crop Bulletins 1–21, 1888; 1–24, 1889; 1-25, 1890; 2 and 4, 1891.

North Dakota. — 4th Annual Report, for 1893.

Ohio. — All Bulletins of First Series, except 16, 17, 18, and 19.

Pennsylvania. — Annual Reports for 1869, 1872, 1879–80, 1881, 1882, 1883, and 1884. [All issued by the State College.] Annual Report for 1895.

Rhode Island. — Part I. of both the 5th and 6th Reports of the College of Agriculture, for 1892 and 1893.

South Carolina. — All Bulletins of the Old Series (previous to 1888) on the work of the Experimental Farm of the South Carolina College. 3d Annual Report, for 1890, and 6th, for 1893.

Tennessee. — Annual Report for 1895.

Texas. — College Bulletins 1–5, 1883–1887. All Station Bulletins later than 39.

Virginia. — Bulletins 59 and 60.

West Virginia. — All Bulletins later than 44. Special Bulletin — Potash and Paying Crops, 1890. All Annual Reports later than the 3d, for 1890.

Ontario Department of Agriculture, Toronto. — Bureau of Industries. — Agricultural Returns to the Ontario Bureau of Industries, Nov. 1882 (5th), Aug. 1883 (7th), and Nov. 1887 (20th).

TRANSACTIONS

OF THE

Massachusetts Horticultural Society,

FOR THE YEAR 1896.

PART III,

BEING THE LIST OF

ACCESSIONS TO THE LIBRARY

DURING THE YEAR.

BOSTON:
PRINTED FOR THE SOCIETY.
1899.

See last page of cover; also list of Books Wanted, p. 411.

TRANSACTIONS

OF THE

Massachusetts Horticultural Society,

FOR THE YEAR 1896.

PART III,

BEING THE LIST OF

ACCESSIONS TO THE LIBRARY

DURING THE YEAR.

BOSTON:
PRINTED FOR THE SOCIETY.
1899.

LIBRARY ACCESSIONS, 1896.

In the following list the books purchased from the income of the Stickney Fund are marked S. F., and those purchased from the Society's Library Appropriation, L. A. All others were received by donation and exchange, and the source whence received is given in every instance when known.

The measurements of the books are in inches and tenths of an inch, giving first the height, next the thickness, and lastly the width. When a pamphlet is less than one-tenth of an inch in thickness the place of that dimension is supplied by a dash.

GENERAL HORTICULTURE.

Slade, Daniel Denison. The Evolution of Horticulture in New England. Half light brown calf, 7.×.8×4.5, pp. v, 180. New York and London, and New Rochelle, N. Y.: 1895. The Author.

Horticultural Directory and Year Book for 1896. 37th year of publication. Blue-green paper, 7.×.9×4.8, pp. 512. London: (1896). S. F.

Garden Oracle and Illustrated Floricultural Year Book, 1896. By the Editor of "The Gardeners' Magazine." 38th year of publication. Half red cloth, 7.3×.8×5., pp. 276; 1 colored plate, cuts. London: (1896). S. F.

Bailey, L. H. Plant-Breeding. Being five lectures upon the amelioration of domestic plants. (Garden-Craft Series). Light green linen, 7.×.7×5.8, pp. xii, 293; 20 cuts. New York and London: 1895. S. F.

Hibberd, Shirley, F. R. H. S. Profitable Gardening; a practical guide to the culture of vegetables, fruits, and other useful out-door garden products; intended for the use of amateurs, gentlemen's gardeners, allotters, and growers for market. New edition. Green cloth, 7.3×.8×5., pp. iv, 296; cuts. London: n. d. S. F.

Sanders, T. W., F. R. H. S. An Encyclopædia of Gardening. A Dictionary of Cultivated Plants, etc. Second Edition. Olive-green cloth, 7.4×1.3×5., pp. 435. London: 1896. S. F.

The Garden that Paid the Rent. Boards, salmon-color, 7.3×.5×4.7, pp. 127. London: 1860. S. F.

Lazenby, William R. Horticulture and Health. Address by William R. Lazenby, Vice-President, Section 1, of the American Association for the Advancement of Science at the Buffalo Meeting, August, 1896. [Proc. A. A. A. S., Vol. XLV, 1896.] Pamph., drab, 9.6×—×6.1, pp. 18. The Author.

GENERAL HORTICULTURE, *continued.*

(**Manuscript** Journal of Gardening Operations. Aug. 10, 1822 to May 8, 1836.) Red flexible leather covers, 7.4×.3×4.5, pp. (78). Mrs. J. F. Pratt.

HORTICULTURAL JOURNALS.

Northwest Horticulturist, Agriculturist, and Dairyman. Vol. 9. Nos. 1–12. 12 pamphs., 15.×—×11., pp. 191; cuts. Tacoma and Seattle, Washington: 1896. C. A. Tonneson, Secretary State Board of Horticulture, Tacoma, Washington.

L'Horticulteur Français de mil huit cent cinquante et un. Journal des Amateurs et des intérêts horticoles. Rédigé par F. Herincq. Vols. 1 – (21). 1851–1872. Half black leather, 9.4×1.×6.2, colored plates, cuts. Paris: 1851–1872. S. F.

HORTICULTURAL SOCIETIES.

New Hampshire Horticultural Society. Premium List for the Third Annual Exhibit, Concord, Sept. 22–24, 1896, together with the Rules and Regulations of the Society. Pamph., drab, 7.6×—×5.4, pp. 17. Concord, N. H.: 1896. W. D. Baker, Secretary.

Melrose Amateur Gardeners' Society. Rules concerning the Exhibition of Sept. 7, 1896. List of Prizes, etc. Pamphs., 5.7–8.6×—×4.3–5.5. George H. Wills, President.

Worcester County Horticultural Society. Schedule of Premiums, for the year 1896. Pamph., 9.2×—×5.7, pp. 31. Worcester: 1896. E. W. Lincoln, Secretary.

Rhode Island Horticultural Society. Chrysanthemum Exhibition, Providence, R. I., Nov. 1896. Premium List. Pamph., 8.3×—×5.5, pp. (4). C. W. Smith, Secretary.

Western New York Horticultural Society. Proceedings of the Forty-first Annual Meeting, held at Rochester, Jan. 22 and 23, 1896. Pamph., terra-cotta, 8.3×.2×5.7, pp. 155. Rochester: 1896. John Hall, Secretary and Treasurer.

New Jersey State Horticultural Society. Proceedings at its Twenty-first Annual Session, held at Trenton, N. J., Jan. 2 and 3, 1896. Pamph., gray, 8.9×.4×5.8, pp. 164, (2). Mount Holly, N. J.: 1896. Henry I. Budd, Secretary.

Pennsylvania Horticultural Society. Transactions. Vol. 1. Including the papers read from December, 1894, to December, 1895, with a description of the exhibition of 1895, and of the ceremony of the laying of the cornerstone of the new building. Pamph., drab, 9.×.4×5.8, pp. 152; 2 plates. Philadelphia: 1896.

Schedule of Prizes at the Annual Exhibition of Chrysanthemums, Flowers, Plants, Fruit and Vegetables, Nov. 10–14, 1896. To which is appended a list of premiums offered for competition at the

monthly meetings of the Society during 1896. Pamph., light green, 9.2×.1×5.9, pp. 27. Philadelphia: 1896.

Horticultural Hall, Philadelphia. Plans of the Building and Statements as to its Erection. Pamph., tea, 7.5×.1×5.3, pp. 21; 2 plates, plans. Philadelphia: 1894. David Rust, Secretary.

Peninsula Horticultural Society. Transactions. 2d, and 6th to 9th Annual Sessions. January, 1889, and January, 1893—January, 1896. 5 pamphs., tea, terra-cotta, etc., 8.7–9.2×.2×6., pp. 86, 88, 82, 102, 110. Wilmington and Dover, Del.: (1889) and 1893–1896. Prof. Wesley Webb.

North Carolina State Horticultural Society. Sixteenth Annual Meeting, Southern Pines, N. C., August 20–21, 1896. Program. Pamph., blue, 8.5×—×5.4, pp. (4). Gerald McCarthy, Secretary.

Ohio State Horticultural Society. Twenty-ninth Annual Report. For the year 1895–6. Pamph., pink, 9.4×.4×6.5, pp. 244; 1 plate, cuts. W. W. Farnsworth, Secretary.

Columbus (Ohio) Horticultural Society. Annual Report. For the year ending December 31, 1895. Containing Constitution, List of Members, and Quarterly Journal. Vol. 10. Prepared by J. S. Hine, Secretary. Dark green cloth, 9.×.7×6., pp. viii, 172, (3); 2 plates, 1 portrait. Columbus: 1896. The Secretary.

Indiana Horticultural Society. Transactions for the year 1895, being a report of the Thirty-fifth Annual Meeting held in Indianapolis, Dec. 3–5, 1895, together with reports of the Summer Meeting held at South Bend, August 21 and 22, etc. Black cloth, 9.1×.5×6., pp. 175. Indianapolis: 1896. James Troop, Secretary.

Chicago Horticultural Society. Annual Fall Exhibition, Nov. 10–14, 1896. Preliminary List, Revised List, Programme and Revised List. 3 pamphs., 8.7×—×5.8, pp. (12), (12), 24. Edgar Sanders.

Minnesota State Horticultural Society. Annual Report. Vol. XXIII. 1895. Embracing the Transactions of the Society from Jan. 8, 1895, to Dec. 3, 1895, including the eleven numbers of "The Minnesota Horticulturist" for 1895. Black cloth, 9.3×1.3×6.3, pp. 505; 9 plates, cuts. Minneapolis: 1895. A. W. Latham, Secretary.

Missouri State Horticultural Society. Thirty-eighth Annual Report. Meetings at Willow Springs, June 4–6, and Neosho, December 3–5, 1895. L. A. Goodman, Secretary. Red cloth, 9.3×1.×6., pp. 428, iii; frontispiece, 3 plates, cuts. Jefferson City: 1896. L. A. Goodman, Secretary. [10 copies.]

Kansas State Horticultural Society. Fourth Biennial Report, containing the Proceedings of Annual Meeting held at Fort Scott in December, 1894, and Annual Meeting held at Lawrence in December, 1895. Vol. XX. Claret-brown cloth, 9.3×.4×6.2, pp. 100; 1 portrait. Topeka: 1896. Edwin Taylor, Secretary.

HORTICULTURAL SOCIETIES, *continued.*

Royal Horticultural Society.

Journal. Edited by the Rev. W. Wilks, M. A., Secretary, and Mr. John Weathers, Assistant Secretary.

Vol. XIX, Part 3. March, 1896. pp. 345–460, ci–ccxxxvi.

Vol. XX, Part 1. August, 1896. pp. 76, cxxviii; 14 cuts.

2 pamphs., gray, 8.4×.5×5.5. London: 1896. The Secretary.

Report of the Council for the year 1895–96, with List of Fellows, Associates and Affiliated Societies.

Pamph., gray, 8.2×.2×5.5, pp. 86. London: (1896). The Secretary.

Arrangements for the year 1896.

Pamph., gray, 8.3×.2×5.5, pp. 58. London: (1896). The Secretary.

Rules for Judging and Suggestions to Schedule-Makers, Judges and Exhibitors, drawn up by a Committee of the Royal Horticultural Society and issued by the order of the Council for use at Horticultural Exhibitions. 1896 Code. December, 1895.

Pamph., gray, 8.4×.1×5.4, pp. 48. London: 1896. L. A. (2nd copy from Francis H. Appleton).

Catalogue of the Society's Eighth Great Annual Flower Show. May 21–23, 1895.

Pamph., straw-color, 8.5×.1×5.5, pp. 22, xxxix. Francis H. Appleton.

Royal Caledonian Horticultural Society. Prize List and Rules for Spring and Autumn Flower Shows to be held April 8 and 9, and Sept. 9 and 10, 1896. Pamph., blue, 8.4×.1×5.3, pp. 23. The Society.

France, Société nationale d'Horticulture de. Journal. 3e série. Tome XVIII, 1896. 12 pamphs., gray, 8.5×.1–.3×5.4, pp. 1231.

Supplément au Journal. Congrès international d'Horticulture de 1895. Pamph., orange, 8.5×.2×5.5, pp. 148, (1); cuts. Paris: 1895. The Society.

Congrès horticole de 1896. Mémoires préliminaires. Pamph., pink, 8.4×.1×5.5, pp. 96. Paris: (1896).

Supplément au Journal. Congrès horticole de 1896. Procès-verbaux des Séances. Pamph., green, 8.5×—×5.4, pp. xxxii. Paris: 1896. M. Bergman, Secrétaire.

Seine-Inférieure, Société centrale d'Horticulture de la. Bulletin. Tome XXXVII, 3e et 4e cahiers de 1895; Tome XXXVIII, 1er—4e cahiers de 1896. 5 pamphs., lilac-color, 9.×.1–.3×5.6, pp. 129–345; 1–382. Rouen: 1895, 1896. The Society.

Sarthe, Société d'Horticulture de la. Bulletin. Tome XII.—1895, 2e–4e trimestres; Tome XIII.—1896, 1er–4e trimestres. 7 pamphs. salmon-color, 8.7×—×5.6, pp. 577–678; 1–148. (Le Mans:) 1895 1896. The Society.

Cercle horticole du Nord, Bulletin du. 27e Année. 12 numbers. January to December, 1896. 12 pamphs., gray, 8.9×—×5.5, pp. 300. Lille: (1896). M. Mulnard, Secrétaire-général.

Société d'Horticulture d'Orléans et du Loiret. Bulletin. 3e Série. Tome III.—1895, Nos. 1-4 and 1896, Nos. 1-4. 8 pamphs., blue, 9.8×.1×6.6, pp. 185–560; cuts. Orléans: 1895–1897. Eugène Delaire, Secrétaire-général.

Londres, Société Française d'Horticulture de. Bulletin. Année 1895. (Septième Année. No. 7.) Pamph., gray, 9.5×.2×6., pp. 111, (1); frontispiece, 5 plates. Tours: 1896. C. Harman Payne.

Gartenflora. Zeitschrift für Garten- und Blumenkunde. (Begründet von Eduard Regel.) (Organ des Vereins zur Beförderung des Gartenbaues in den Preussischen Staaten.) 44 Jahrgang. Herausgegeben von Dr. L. Wittmack. 24 numbers. Half calf, 10.4×1.8×7.5, pp. 686; 12 colored plates (1410-1421), 133 cuts. Berlin: 1895. The Editor.

Berlin, Grossen Allgemeinen Gartenbau-Ausstellung, Programm der. 28 April—9 Mai, 1897, Treptower Park, Berlin. (Feier des 75 jährigen Jubiläums des Vereins zur Beförderung des Gartenbaues in den Preussischen Staaten.) Pamph., green, 9.6×—×6.8, pp. 46, (1). Berlin: 1896.

Erster Nachtrag, etc. Pamph., green, 9.6×—×6.7, pp. 14. Berlin: 1896. The Editor of "Gartenflora."

Hamburger Gartenbau-Ausstellung, 1897, Das Programm der Grossen. Pamph., 8.9×—×5.5, pp. (5).

Hamburg, Allgemeine Gartenbau-Ausstellung in, 1897, geöffnet vom Mai bis September. [Premium List.] Pamph., gray, 8.4×.2×5.3, pp. 158. Dr. T. G. Mönckeberg. [Also English Edition of same. Pamph., pink.]

I Nachtrag zum Programm vom 1 April, 1896. Pamph., 8.3×—×5.2, pp. 14.

II Nachtrag, etc. Pamph., lilac, 8.5×.1×5.4, pp. 68.

Genève, Société d'Horticulture de. Bulletin. 41me Année. 1896. 12 pamphs., pink, 9.5×—×6.2, pp. 195; cuts. Genève: 1896. The Society.

R. Societa Toscana di Orticultura. Bullettino. Anno XXI. 1896. (Vol. I della 3.a Serie.) 11 pamphs., cream-color, 10.6×.1×7.2, pp. 327; 12 plates, colored and plain, 20 cuts. Firenze: 1896. The Society.

Japanese Horticultural Society. Journal. Nos. 67 and 69–75. November, 1895 — August, 1896. 8 pamphs., tea, 8.7×—×5.8. Tokyo: 1895, 1896. S. Yoshida.

FLOWERS AND ORNAMENTAL PLANTS.

Breck, Joseph, & Sons, *Publishers.* Success with House Plants. A practical treatise on their care and cultivation. Pamph., 6.×.1×4., pp. 33, (7). Boston: 1896. The Publishers.

FLOWERS AND ORNAMENTAL PLANTS, *continued.*

Bloudeau, Henri. La Domiculture. Nouvelle Méthode de Culture intensive des plantes en appartements. Cream-colored paper, 7.2×.7×4.6, pp. vi, (1), 330. Paris: 1896. S. F.

Loudon, Mrs. (Jane Wells). My Own Garden; or, The Young Gardener's Year Book. Light green cloth, 7.×.5×5., pp. iv, 98; 4 plates. London: 1855. S. F.

D'Ombrain, Rev. H. Honywood, *Editor.* The Rosarian's Year-Book for 1896. Boards, gray, 7.×.3×5.4, pp. (4), 54; 1 portrait. London and Derby: 1896. S. F.

Hints on Planting Roses. By a Committee of the National Rose Society. Pamph., gray, 7.1×—×5.1, pp. 14, (1). (Croydon: 1895.) L. A.

Warner, Robert, F. L. S., F. R. H. S., and Henry Williams, F. L. S., F. R. H. S. The Orchid Album, comprising coloured figures and descriptions of new, rare, and beautiful Orchidaceous Plants. Vol. XI, parts 129 and 130. 2 parts, straw-colored paper, 12.5×.1×10., colored plates 513–520, and descriptive text. London: (1896?) S. F.

Linden, J., Lucien Linden, Em. Rodigas and A. Cogniaux. Lindenia.—Iconography of Orchids. [English Edition.] *Vol. 9*, parts 51–54. April — July, 1895. pp. 21–53, (12); colored plates 465–480. Ghent: 1895. *Vol. 10*, parts 55–60. August, 1895 — January, 1896. pp. 1–53; colored plates 481–504. Ghent: 1895, 1896. *Vol. 11*, parts 61–66. February — July, 1896. pp. 1–53; colored plates 505–528. Ghent: 1896. *Vol. 12*, part 67. August, 1896. pp. 1–12; colored plates 529–532. Brussels: 1896. S. F.

Brunning, G., & Sons. Chrysanthemums and how to grow them. With select Lists of all the newest and most suitable Varieties for Pot Culture and Exhibition Purposes. Pamph., 8.3×—×5.5, pp. 19. Melbourne: 1894. C. Harman Payne.

Jones, H. J., F. R. H. S., F. N. C. S. The Chrysanthemum Album. Pamph., cream-color, 12.2×.3×9.8, 37 plates with descriptions, portrait. Lewisham, S. E.: 1896. The Author.

Lees, W. H., W. Tunnington, E. Molyneux, and C. Orchard. Owen's Chrysanthemum Culture. For Exhibition, Conservatory, and Garden Decoration. Pamph., salmon-color, 7.2×.1×5.9, pp. 52. C. Harman Payne.

Wells' Book on the Culture of the Chrysanthemum for exhibition, decoration, cut flower, and market. Pamph., salmon-color, 7.1×.2×5.7, pp. vi, (2), 75; 1 portrait, cuts. Redhill, Surrey: n. d. C. Harman Payne.

Chabanne, G., et A. Choulet. Culture des Chrysanthèmes. Pamph., straw-color, 7.9×.1×5.3, pp. 63; cuts. Lyon: 1896. C. Harman Payne.

Cordonnier, Anatole. Le Chrysanthème a la grande fleur, les variétés qui se prêtent le mieux a cette culture, etc. Pamph., cream-color, 8.8×.5×5.7, pp. 156; 9 plates, cuts. Bailleul (Nord): n. d. C. Harman Payne.

Viviand-Morel, V. Instructions sur la culture des Chrysanthèmes a la grande fleur. 2me édition. Revue et augmentée d'un chapitre sur la fécondation et l'hybridation des Chrysanthèmes. Pamph., tan-color, 7.×.1×4.5, pp. vi, 7–47; cuts. Paris: n. d. L. A.

Ravenscroft, B. C. Carnation Culture for Amateurs: containing full instructions for the culture of Carnations of all classes in the open ground and in pots. Pamph., gray, 7.3×.3×4.8, pp. (1), 84; 18 cuts. London: 1896. S. F.

Van Eeden, A. C., & Co., *Editors.* Album Van Eeden. Flora of Haarlem. Colored plates of Dutch Bulbs and Bulbous Plants. Half red morocco, 14.2×1.6×11.2, 120 colored plates, with descriptive text. Haarlem: 1872–1881. S. F.

Rudolph, Jules. Les Nepenthes et leur culture. Étude botanico-horticole sur les Nepenthes. Mémoire couronné et extrait du Journal de la Société nationale d'Horticulture de France. Pamph., cream-color, 8.4×—×5.4, pp. 31; 5 cuts. Paris: 1896. L. A.

Noter, Raphael de. Les Palmiers de serre froide; leur culture dans la zone méditerréenne et dans le nord de l'Europe. Précédé d'une préface-lettre de M. Charles Rivière. (Bibliothèque d'Horticulture et de Jardinage.) Tan-colored cloth, 7.×.5×4.6, pp. xvii, 150; 52 cuts. Paris: 1895. S. F.

Mitford, A. B. Freeman-, C. B. The Bamboo Garden. Illustrated by Alfred Parsons. White linen, 9.×.9×6., pp. xii, 224; frontispiece, 8 plates. London and New York: 1896. S. F.

FLORICULTURAL SOCIETIES.

American Florists, Society of. Proceedings of the Twelfth Annual Convention, held at Cleveland, Ohio, August 18–21, 1896. Pamph., blue, brown cloth back, 8.7×.3×5.7, pp. 110, xxxviii; 1 portrait. Boston: 1896. William J. Stewart, Secretary.

American Florist Company's Directory of Florists, Nurserymen and Seedsmen of the United States and Canada, and Reference Book, giving a list of the Florists, Nurserymen and Seedsmen, geographically and alphabetically arranged. Etc. (Fifth edition.) Half black leather, 7.5×.7×4.8, pp. 335. Chicago: 1896. L. A.

New York Florists' Club and the New York Gardeners' Society. Schedule of Premiums for the First Annual Exhibition of Roses, Garden Flowers, etc., . . . June 20, 1896. Pamph., 8.4×—×5.5, pp. (4.)

American Carnation Society. First Annual Report, etc. 1891–92. Philadelphia, New York, Buffalo, and Washington. pp. 78; portrait.

(Second) Annual Report. 1893. Pittsburgh, Pa., Feb. 21–22. pp. 90.

(Third) Annual Report. 1894. Indianapolis, Ind., Feb. 21–22. pp. 55; portrait.

Fifth Annual Meeting. Proceedings. New York, Feb. 20–21, 1896. pp. 72; portrait, cuts.

4 pamphs., blue, etc., 9.2×.2×5.7. New York: (1892)–1896. Albert M. Herr, Secretary.

FLORICULTURAL SOCIETIES, *continued.*

Chrysanthemum Society, The National. Annual Report and Financial Statement for 1895. Grand Jubilee Celebration. Schedule of Prizes, etc., 1896. Pamph., blue, 8.2×.2×5.3, pp. 78. C. Harman Payne, Foreign Corresponding Secretary.

Protection des Plantes, Association pour la. Bulletin. *No. 11*, 1893, pp. 64; cuts. *No. 12*, 1894, pp. 80; cuts. *No. 13*, 1895. pp. 96; cuts. *No. 14*, 1896, pp. 80; cuts. 4 pamphs., green, 9.×.1×6.2. Genève: 1893–1896. Henry Correvon, President.

FRUITS.

Wright, John, F. R. H. S. The Fruit Grower's Guide. With illustrations by Miss May Rivers, and numerous illustrative diagrams by Worthington G. Smith and George Shayler. 3 vols. (1.) pp. x, 344; frontispiece, 11 colored plates, 108 cuts. (2.) pp. viii, 344; frontispiece, 14 colored plates, 109 cuts. (3.) pp. viii, 363; frontispiece, 15 colored plates, 89 cuts. Half olive-green morocco, 11.4× 1.6×9.1. London: (1892.) S. F.

Jamin, Fd. Les Pommes Dean's Codlin et Deans' Codlin. (Extrait du Journal de la Société nationale d'Horticulture de France. Cahier de mai, 1896). Pamph., 8.4×—×5.4, pp. 2.

Opoix, O. La Culture du Poirier. (Bibliothèque d'Horticulture et de Jardinage.) Tan-colored cloth, 7.×.6×4.6, pp. iv, 271; 112 cuts. Paris: 1896. S. F.

Fuller, Andrew S. The Nut Culturist. A Treatise on the Propagation, Planting and Cultivation of Nut-bearing Trees and Shrubs adapted to the climate of the United States, with the scientific and common names of the fruits known in commerce as edible or otherwise useful nuts. Green cloth, 7.5×.8×5.3, pp. viii, 289; 1 portrait, cuts. New York: 1896. S. F.

Also second copy presented by Mrs. Fuller.

Baltet, Charles. Fruit Culture in France. A paper read before the Royal Horticultural Society, August 14, 1894. (Reprinted from the Journal of the Royal Horticultural Society, Vol. XIX, Part 2.) Pamph., gray, 8.4×.1×5.4, pp. 60. London: 1895. The Author.

Héron, A. L'Œuvre Pomologique de la Société Centrale d'Horticulture. Pamph., gray, 9.×.3×5.7, pp. 104. Rouen: 1896. A. Héron, President.

FRUIT GROWERS' SOCIETIES.

Joly, Ch. Note sur la Vingt-quatrième Session de la Société Pomologique Américaine. (Extrait du Journal de la Société nationale d'Horticulture de France. Cahier de décembre 1895.) Pamph., gray, 8.5 ×—×5.3, pp. 8. Paris: 1896. The Author.

Maine State Pomological Society. Transactions for the year 1895, including the Proceedings of the Winter Meeting, held in Presque Isle, Jan. 8 and 9, 1896. Edited by the Secretary, D. H. Knowlton. Pamph., light blue, 9.×.3×5.7, pp. 119; frontispiece, 3 plates. Augusta: 1896. The Secretary.

Ontario Fruit Growers' Association. Twenty-seventh Annual Report. 1895. Pamph., salmon-color, 9.7×.2×6.5, pp. 128. Toronto: 1896. L. Woolverton, Secretary.

—— —— —— ——. Annual Meeting, beginning Wednesday, December 2d, 1896, . . . Kingston, Ont. Programme. Pamph., green, 6.3× —×8.1, pp. (8). Grimsby, Ont.: (1896). L. Woolverton, Secretary-Treasurer.

La Pomologie Française. Bulletin mensuel de la Société pomologique de France. 1896. 11 pamphs., gray, 9.5×.1×6.2, pp. 400; cuts. Lynn: 1896. Louis Cusin, Secrétaire-général.

VEGETABLES.

Malden, W. J. The Potato in Field and Garden. Green cloth, 7.6×.9× 5.4, pp. xii, 217; (11) plates, cuts. London: 1895. S. F.

Photograph. The new Japanese tree, or climbing, Cucumber, as grown by D. T. Curtis, Medford, in 1895. 7.9×9.9. Daniel T. Curtis.

GREENHOUSES, ETC.

Bouché, Carl David, und Julius Bouché. Bau und Einrichtung der Gewächshäuser. Ein Handbuch für Gärtner und Baumeister. *Text*, drab paper, 9.5×.8×6.5, pp. ix, 362. *Atlas*, boards, drab, plum-colored cloth back, 12.8×.7×8.8, 29 plates with explanations (pp. 53). Bonn: 1886. Theodore M. Clark.

Plenty, Josephus. Horticultural Building and Construction. Pamph., tea, 9.1×.1×5.7, pp. 48; cuts.

—— ——. Greenhouse Heating and Ventilating Apparatus. Pamph., gray, 5.8×—×9.4, pp. 24; cuts.

Smith and Thayer Company, *Publishers*. Catalogue of the Winchester. For Steam and Hot Water Heating. Pamph., yellow, 8.2×.1×5.7, pp. 56. (Boston: 1896.) The Publishers.

PARKS.

Metropolitan Park Commissioners. Report, January, 1896. Dark maroon cloth, 9.2×.6×6., pp. 107; frontispiece, 16 plates, 11 maps Boston: 1896. The Commissioners.

Metropolitan Park Commission. Flora of the Blue Hills, Middlesex Fells, Stony Brook and Beaver Brook Reservations of the Metropolitan Park Commission, Massachusetts. Preliminary edition, 1896. Half black morocco, 9.2×.9×6., pp. viii, 144; 3 maps. Boston: 1896. The Commissioners.

PARKS, *continued.*

Boston, City of. Department of Parks. (Twenty-first) Annual Report of the Board of Commissioners, for the year ending January 31, 1896. Pamph., 9.×.2×5.8, pp. 90; 10 plates, 1 plan, 1 table. (Boston: 1896.) The City of Boston.

Lynn (Mass.) Park Commissioners. Seventh Annual Report. For the year ending Dec. 20, 1895. Pamph., tea, 9.1×.1×5.8, pp. 19; frontispiece, 2 plates, 1 plan. Lynn, Mass.: 1896. Nathan W. Hawkes, Secretary.

Brooklyn Department of Parks. Thirty-first Annual Report, for the years 1891 and 1892. pp. 76; 5 plates.

Thirty-third Annual Report, for the year 1893. pp. 55; 5 plates.

Thirty-fourth Annual Report, for the year 1894. pp. 83; 14 plates, 4 plans.

Thirty-fifth Annual Report, for the year 1895. pp. 167; frontispiece, plates, cuts, 1 plan.

1 pamph., terra-cotta, and 3 vols., cloth, dark green and brown. Brooklyn: 1893–1896. J. E. Smith, Secretary.

Brooklyn Tree Planting and Fountain Society. Annual Report. December, 1895. Pamph., pale green, 9.×.4×5.7, pp. 83; cuts. Brooklyn: 1896.

Circulars 11–15, Jan. 1896. 4 circulars, 9.2–10.8×5.5–8.4. Lewis Collins, Secretary.

West Chicago Park Commissioners. Seventh Annual Report, for the year ending February 29th, 1876. pp. 27. Chicago: 1876.

Twenty-first Annual Report, for the year ending Feb. 28, 1890. pp. 10. Chicago: 1890.

Twenty-third Annual Report, for the year ending Feb. 29, 1892. pp. 44, i–xix, 64–67. Chicago: 1892.

Twenty-seventh Annual Report, for the year ending December 31, 1895. pp. 70, (2); 15 plates, 1 map. Chicago: 1896.

4 pamphs., gray, blue, 8.6–9.×.1–.2×6. Edgar Sanders.

South Park (Chicago). Report of the Commissioners to the Board of County Commissioners of Cook County. From Dec. 1, 1894 to Dec. 1, 1895. Pamph., terra-cotta, 8.5×—×5.8, pp. 43; 1 plan. Chicago: 1896. Edgar Sanders.

Lincoln Park (Chicago). Annual Report of the Commissioners for the year ending March 31, 1880. Pamph., drab, 9.2×.1×6., pp. 41; 1 map. Chicago: 1880.

For the year ending March 31, 1881. Pamph., drab, 8.8×.1×5.9, pp. 20; 1 map. Chicago: 1881.

From April 1, 1895 to March 31, 1896. Pamph., 8.6×—×5.5, pp. 30. Chicago: 1896. Edgar Sanders.

Garfield, Charles W. Our City's Breathing Places. Remarks before All Souls Unity Club, April 8, 1896. Pamph., 6.7×—×4.2, pp. 11. (Grand Rapids, Mich.: 1896). The Author.

CEMETERIES.

American Cemetery Superintendents, Association of. Proceedings. Ninth Annual Convention, held at Richmond, Va., Sept. 18 — 20, 1895. Pamph., blue, 8.4×.2×5.7, pp. 82; frontispiece. Chicago: (1895).

Tenth Annual Convention, held at St. Louis, Mo., September 15–17, 1896. Pamph., flesh-color, 8.6×.2×5.7, pp. 110; cuts. Chicago: (1896.) John G. Barker.

Mount Auburn Cemetery. Sixty-fourth Annual Report. Jan. 1, 1896. Pamph., tea, 8.8×—×5.8, pp. 15. Boston: 1896. The Trustees.

TREES.

Sargent, Charles Sprague, Director of the Arnold Arboretum of Harvard University. The Silva of North America. A Description of the Trees which grow naturally in North America, exclusive of Mexico. Illustrated with figures and analyses drawn from nature by Charles Edward Faxon.

Vol. IX. Cupuliferæ — Salicaceæ. pp. (vii), 190; plates 439–496.
Vol. X. Liliaceæ — Coniferæ. pp. (vii), 159; plates 497–537.
2 vols.; boards, gray, 14.7×1.8–2.4×11.7. Boston and New York: 1896. S. F.

Mathews, F. Schuyler. Familiar Trees and their Leaves. With over two hundred drawings by the author and an Introduction by Prof. L. H. Bailey, of Cornell University. Light green linen, 7.6×1.×5.2, pp. x, 320; frontispiece, 2 plates, cuts. New York: 1896. S. F.

Pinchot, Gifford, and Henry S. Graves. The White Pine: a study. With tables of volume and yield. Green linen, 7.×.6×4.6, pp. ix, 102; frontispiece, 6 plates, cuts. New York: 1896. S. F.

Hersey, Edmund. Facts gathered by observation and experience relating to the White Pine (*Pinus Strobus*, L.) *Part I.* Growth of the Tree. *Part II.* Value of the Pine as a Timber Tree. *Part III.* An answer to the criticisms of Part II. (Bulletin of the Bussey Institution of Harvard University, *Vol. II, Part V.*) 1896. 3 pamphs., 9.2×—×5.9, pp. (4), (5), and(4.) The Author.

Scotland, Highland and Agricultural Society of. Old and Remarkable Trees of Scotland. (Conclusion.) Pamph., green, 8.6×.3×5.6, pp. (1), 113–247. Edinburgh: 1867. L. A.

Mouillefert, P. Traité des Arbres et Arbrisseaux forestiers, industriels et d'ornement, cultivés ou exploités en Europe et plus particulièrement en France, etc. Livraisons 27–29. Green paper, 9.8×.1×6.4, pp. 833–928; colored plates 30–32, 26^{bis}, 26^{ter} & 27^{bis}; photographic plates 132–137. Paris: n. d. S. F.

Allen, Charles H. The Artificial Preservation of Timber. Pamph., blue, 6.8×—×10.8, pp. 27; cuts. The Author.

FORESTRY.

Schlich's Manual of Forestry. Vol. V. Forest Utilization, by W. R. Fisher, B. A. Being an English Translation of "Die Forstbenutzung," by Dr. Karl Gayer. Green cloth, 9.×.2×6.1, pp. xvi, 779; 3 plates, 340 cuts. London: 1896. S. F.

New Jersey Forestry, Report on. (1.) Report on Forestry in Northern New Jersey. By C. C. Vermeule. (2.) Report on Forest Fires for season of 1895. By John Gifford. (3.) Notes on the Forests of New Jersey. By Gifford Pinchot. (From Report of the Geological Survey of New Jersey, 1895.) Pamph., gray, 9.×.2×5.7, pp. 99–188; 1 plate. Trenton: 1896. John Gifford, Editor of "The Forester."

Wright, Ellen. Elizur Wright's Appeals for the Middlesex Fells and the Forests. With a Sketch of what he did for both. By his daughter. Pamph., gray, 7.7×.4×5.2, pp. xxiv, 156. Medford: 1893. J. W. Manning.

Balfour, Edward, L. R. C. S. E., etc. The Timber Trees, Timber, and Fancy Woods, as also, the Forests of India and of Eastern and Southern Asia. Second Edition. Half calf, 10.×1.2×6.5, pp. (1), 358. Madras: 1862. S. F.

FORESTRY JOURNALS.

Forester, The. An Illustrated Journal Devoted to Forestry. Official Organ of the New Jersey Forestry Association. Vol. II, Nos. 1–6, January–December, 1896. 5 pamphs., tea, 11.×—×8.5, pp. 87; plates, cuts. Camden, N. J.: 1896. John Gifford, Editor.

Forest Leaves. Published by the Pennsylvania Forestry Association. Vol. V. Nos. 7–12. February–December, 1896. 6 pamphs., 10.3×—×7.6, pp. 97–192; 12 plates. Philadelphia: 1896. John Birkinbine, Publisher.

Eaux et Forêts, Annuaire des, pour 1896. 35e Année. Blue cloth, 6.×.6×4.1, pp. 384. Paris: 1896. *The Publishers of* Revue des Eaux et Forêts.

Bulletin d'arboriculture, de floriculture et de culture potagère, rédigé par Fr. Burvenich, Éd. Pynaert, Ém. Rodigas et Hub. Van Hulle. (Organe du Cercle d'Arboriculture de Belgique.) 6me Série, Vol. IV, 1896. 12 numbers. Pamphs., gray, 9.2×.1×5.9, pp. 384; colored plates, cuts. Gand: 1896. The Editors.

FORESTRY ASSOCIATIONS, COMMISSIONS, ETC.

American Forestry Association. Proceedings at the Thirteenth and Fourteenth Annual Meetings, Dec., 1894, and Jan., 1896, at Washington, and at the Summer Meetings at Brooklyn, N. Y., and Springfield, Mass. Vol. XI. (Part I.) March 1, 1896. Pamph., tea, 9.×.2×5.8, pp. 64. Washington: 1896. The Association.

New Hampshire Forestry Commission. Report. January Session, 1891. Black cloth, 9.×.3×6., pp. 56. Manchester: 1891.

Second Report. January Session, 1893. Black cloth, 9.×.5×6., pp. 139; 2 maps. Concord: 1893.

Second Annual Report. 1894. Vol. I, Part II. Pamph., tea, 8.7×.3×5.8, pp. 15–143; 5 maps. Concord: 1894.

The State Librarian.

New York Forest Commission. Annual Report for the year 1893. 2 vols., green cloth, 9.1×1.2×6., pp. 388 and 468; 31 plates, 1 map. Albany: 1894.

Annual Report for the year 1894. Green cloth, 9.2×1.×6., pp. 263; 26 plates (2 colored). Albany: 1895.

Willlam F. Fox, Superintendent, New York Fisheries, Game, and Forest Commission

English Arboricultural Society. Transactions. Vol. III, Part 1. Gray paper, 8.4×.5×5.5, pp. 140. Carlisle: 1895–96. S. F.

GENERAL AGRICULTURE.

W(orlidge), J(ohn). Systema Agriculturæ; the Mystery of Husbandry Discovered. Etc., etc. To which is added Kalendarium Rusticum or, The Husbandman's Monthly Directions . . . . and Dictionarium Rusticum: or, The Interpretation of Rustick Terms. Etc. The Third Edition carefully corrected and amended, with one whole section added, and many large and useful additions throughout the whole work. By J. W., Gent. Half black morocco, 13.×1.×8.1, pp. (22), 324, (6); 1 plate. London: 1681. S. F.

Voorhees, Edward B., A. M. First Principles of Agriculture. Linen, 7.8×.9×5.4, pp. 212. New York, Boston, Chicago: 1896. The Publishers.

Muir, James, M. R. A. C., etc. Agriculture, Practical and Scientific. Red cloth, 7.2×1.×5.3, pp. xv, 343; 39 cuts. London and New York: 1895. S. F.

Lawes, J. B. Report of Experiments on the Comparative Fattening Qualities of different breeds of Sheep. (Jour. Roy. Ag. Soc. England, Vol. XIII, part I.) Pamph., blue, 8.7×.1×5.7, pp. 21. London: 1852. L. A.

——— — —, and J. H. Gilbert. On the Composition of Foods, in relation to Respiration and the Feeding of Animals. (From Report of the British Association for the Advancement of Science for 1852.) Pamph., brown, 8.5×.1×5.5, pp. 33. London: 1853. L. A.

——— — —. Experiments on the Comparative Fattening Qualities of different Breeds of Sheep. (Jour. Roy. Ag. Soc. England, Vol. XVI, part 1.) Pamph., blue, 8.6×.1×5.4, pp. 45. London: 1855. L. A.

GENERAL AGRICULTURE, *continued.*

Lawes, J. B. and J. H. Gilbert. Experimental Inquiry into the Composition of some of the Animals fed and slaughtered as human Food. (Abstract.) (From the Proceedings of the Royal Society, June 17, 1858.) Pamph., brown, 8.5×—×5.5, pp. 16. London: 1858. L.A.

——— — —. Observations on the recently-introduced Manufactured Foods for Agricultural Stock. (Jour. Roy. Ag. Soc. Eng., Vol. XIX, part I.) Pamph., blue, 8.3×—×5.4, pp. 8. London: 1858. L. A.

TROPICAL AGRICULTURE.

Porter, George Richardson. The Tropical Agriculturist: a practical treatise on the cultivation and management of various productions suited to tropical climates. Half brown calf, 8.2×1.2×5.5, pp. xii, 429; plates, cuts. London: 1833. S. F.

Draper, Walter, F. R. H. S., etc. Gardening in Egypt: A Handbook of Gardening for Lower Egypt. Blue cloth, 7.9×.6×5.3, pp. vi, (1), 113. London: 1895. S. F.

Turner, F., F. L. S., F. R. H. S. The Forage Plants of Australia. (Department of Agriculture, New South Wales.) Dark blue cloth, 9.7×.9×6.3, pp. xviii, 94; (91) plates. n. p. 1891. S. F.

GRASSES AND FORAGE PLANTS.

Massachusetts, Commonwealth of. Annual Report of the Board of Harbor and Land Commissioners for the year 1895. [Contains report on fixing the sand dunes of Cape Cod by planting grasses, etc.] Black cloth, 9.×.3×5.8, pp. 79, (1); 2 plates, 1 map. Boston: 1896. Leonard W. Ross.

Sutton, Martin J. Permanent and Temporary Pastures. Popular Edition. Pamph., pale green, 10.×.4×6.6, pp. viii, 146. London: 1895. Sutton & Sons.

Denaiffe, Clément, et Henri Denaiffe. Manuel pratique de Culture Fourragère. (Bibliothèque des Connaissances utiles.) Tan-colored cloth, 7.×1.×4.7, pp. 383; 108 cuts. Paris: 1896. S. F.

AGRICULTURAL CHEMISTRY.

Lawes, J. B. Agricultural Chemistry. Sheep-Feeding and Manure. Part I. (Jour. Roy. Ag. Soc. England, Vol. X, part I.) Pamph., blue, 8.6×.2×5.6, pp. 76. London: 1849. L. A.

——— — —, and J. H. Gilbert. On Agricultural Chemistry, especially in relation to the Mineral Theory of Baron Liebig. (Jour. Roy. Ag. Soc. England, Vol. XII, part I.) Pamph., blue, 8.5×.1×5.3, pp. 41; 2 diagrams. London: 1851. L. A.

——— — — Agricultural Chemistry. Pig Feeding. (Jour. Roy. Ag. Soc. England, Vol. XIV, part II.) Pamph., blue, 8.7×.2×5.6, pp. 86; 2 diagrams. London: 1854. L. A.

——— — —, and J. H. Gilbert. On the Equivalency of Starch and Sugar in Food. (From the Report of the British Association for the Advancement of Science for 1854.) Pamph., brown, 8.4×—×5.5, pp. 15. London: 1855. L. A.

——— — —, — — — —. On the Amount of, and Methods of Estimating Ammonia and Nitric Acid in Rain-Water. (From the Report of the British Association for the Advancement of Science for 1854.) Pamph., brown, 8.5×—×5.5, pp. 15. London: 1855. L. A.

——— — —. Report to the Right Hon. The Earl of Leicester, on Experiments conducted by Mr. Keary on the Growth of Wheat upon the same Land for four successive years, at Holkham Park Farm. (Jour. Roy. Ag. Soc. England, Vol. XVI, part I.) Pamph., blue, 6.8×—×5.4, pp. 16. London: 1855. L. A.

——— — —, and J. H. Gilbert. Reply to Baron Liebig's Principles of Agricultural Chemistry. December, 1855. (Jour. Roy. Ag. Soc. England, Vol. XVI, part II.) Pamph., blue, 8.6×.2×5.5, pp. 90; 2 diagrams. London. L. A.

——— — —, — — — —. On some points in the Composition of Wheat-Grain, its Products in the Mill and Bread. Pamph., brown, 8.4×.1×5.4, pp. 57. London: 1857. L. A.

——— — —, — — — —. On the Growth of Wheat by the Lois Weedon System on the Rothamsted Soil; and on the Combined Nitrogen in Soils. Pamph., blue, 8.7×.1×5.7, pp. 38. London: 1857. L. A.

——— — —, — — — —. Agricultural Chemistry. On the Growth of Barley by different manures, continuously on the same land; and on the position of the Crop in Rotation. (Jour. Roy. Ag. Soc. England, Vol. XVIII, part II, etc.) Pamph., blue, 8.4×.2×5.4, pp. 80. London: 1858. L. A.

——— — —, — — — —. Report of Experiments with different Manures, on permanent Meadow Land. (With tabular appendix.) (Jour. Roy. Ag. Soc. England, Vol, XIX, part II, and Vol. XX, parts I and II.) Pamph., blue, 8.4×.3×5.4, pp. 111. London: 1859. L. A.

——— — —, — — ——, and Evan Pugh. On the Sources of the Nitrogen of Vegetation, with special reference to the question whether plants assimilate free or uncombined Nitrogen. (Abstract.) (Proc. Roy. Soc. London, June 21, 1860.) Pamph., tea, 8.5×—×5.4, pp. 16. London: 1860. L. A.

——— — —, — — — —. Report of Experiments on the Growth of Red Clover by different Manures. Part I. Pamph., blue, 8.3×—×5.5, pp. 24; 1 plan. London: 1860. L. A.

——— — —, — — — —. Report of Experiments on the Growth of Wheat for twenty years in succession on the same land. Pamph., blue, 8.4×.4×5.4, pp. 109, xli; 2 diagrams. London: 1864. L. A.

SOILS, FERTILIZERS, ETC.

Truffaut, Georges. Sols, Terres, et Composts utilisés par l'Horticulture. Préface de M. Dehérain. (Bibliothèque d'Horticulture et de Jardinage.) Tan-colored cloth, 7.×.8×4.6, pp. iv, 308; cuts. Paris: 1896. S. F.

Barnes, Henry J., M. D. Sewerage Systems, and the epuration of Sewage by Irrigation and Agriculture. [Reprinted from the Boston Medical and Surgical Journal of June 19 and 26 and July 24, 1884.] Pamph., gray, 7.2×.1×5., pp. 48. Cambridge: 1884. The Author. [To replace copy received in 1892.]

Gilbert, J. H., Ph. D., F. C. S. Letter on the Utilization of Town Sewage. (From the "Report." "Ordered by the House of Commons to be printed, August 3, 1857." Appendix XII, pp. 477.) Pamph , dull green, 8.2×—×5.4, pp. 8. Nottingham. L. A.

German Kali Works, *Publishers.* Principles of Profitable Farming. How to raise large crops for the least money. Pamph., 6.9×—×5.1, pp. 48. New York: n. d. The German Kali Works.

AGRICULTURAL JOURNALS.

Genesee Farmer and Gardener's Journal; a weekly paper devoted to Agriculture, Horticulture and Rural Economy. By Luther Tucker, assisted by Willis Gaylord, J. J. Thomas, and others. Vols. VIII and IX. 2 vols., half calf, 12.4×1.×9.7, pp. vii, 416, and vi, 416: cuts. Rochester: 1838 and 1839. Danforth P. Wight, Dedham.

Cincinnatus, The: Edited by the faculty of Farmers' College, College Hill, Ohio. 2 vols., plum-colored cloth, 8.9×1.9×6.1, pp. iv, 608 and viii, 572; plates, cuts. Cincinnati: 1857. Waldo O. Ross.

Semi-Tropical Planter, The: A Monthly Journal, devoted to Southern Agriculture and Horticulture and to Immigration. Harrison Reed, Editor. Vol. 1, No. 2. October, 1875. Pamph., 9.7×.2×6.6, pp. 63–126. Jacksonville, Fla.: 1875. Dr. J. M. Hawks.

AGRICULTURAL SOCIETIES, BOARDS, ETC.

☞ *All the publications of the United States Department of Agriculture, here acknowledged, with the exception of a few which are otherwise credited, were received from Hon. J. Sterling Morton, Secretary of Agriculture.*

☞ *Except in cases where the binding and size are otherwise given, these publications are all octavo pamphlets.*

United States Department of Agriculture. Office of the Secretary.

Report of the Commissioner of Agriculture (for 1863).	pp. 13.		The New England Historic Genealogical Society.	
Same, (for 1866.)	pp. 12.			C. H. Hovey.
Same, for 1868.	pp. 18.	Washington.		1868.
" " 1878.	" 85.	"		1878.
" " 1882.	" 18.	"		1882.
		The New England Historic Genealogical Society.		

Report of the Secretary of Agriculture. 1893. Black cloth, 9.3×1.5×6.1, pp. 608; colored and plain plates, maps, cuts. Washington: 1894.

Report of the Secretary of Agriculture, [1895, *Part I*]; being part of the message and documents communicated to the Two Houses of Congress at the beginning of the First Session of the Fifty-fourth Congress. Black cloth, 9.2×.5×6., pp. 266. Washington: 1895.

Yearbook of the U. S. Department of Agriculture. 1895. [*Part II* of the Report of the Secretary of Agriculture.] Green cloth, 9.2×1.6×6.1, pp. 656; 10 plates, cuts. Washington: 1896.

Report of the Secretary of Agriculture. 1896. [Separate.] pp. 51. Washington: 1896.

Reprints from the Yearbook:—

Frosts and Freezes as affecting Cultivated Plants. By B. T. Galloway. (Reprint from Yearbook, 1895.) pp. 143–158. The Author.

The Two Freezes of 1894–95 in Florida, and what they teach. By Herbert J. Webber. (Reprint from Yearbook, 1895.) pp. 159–174; 1 plate, cuts. B. T. Galloway.

Canadian Field Peas. By Thomas Shaw.—Grass Gardens. By F. Lamson-Scribner.—Forage Conditions of the Prairie Regions. By Jared G. Smith.—Grasses of Salt Marshes. By F. Lamson-Scribner. (Reprint from Yearbook, 1895.) pp. iv, 223–232; 301–332: cuts 46–79. Washington: 1896.

The Health of Plants in Greenhouses. By B. T. Galloway. (Reprint from Yearbook, 1895.) pp. 247–256; cuts. The Author.

Monthly Reports. 1863, with the exception of the September and October numbers; 1864–1873; 1875; and 1876. 8 vols. in half morocco, the rest pamphs. Washington: 1863–1876. 1863–1868 from C. H. Hovey, the family of Hon. Marshall P. Wilder and the New England Historic Genealogical Society.

(*Special Reports,—unnumbered*):—

A Proposed Bill for Establishing an Executive Department, to be called the Department of Agriculture. By Worthington G. Snethen. pp. 16. Washington: 1852. The New England Historic Genealogical Society.

Meteorology in its connection with Agriculture. By Prof. Joseph Henry, Secretary of the Smithsonian Institution. (From the Agricultural Report of the United States Patent Office, 1856.) pp. 455–495; 1 map, cuts. Washington: 1858. The family of Hon. Marshall P. Wilder.

Circular from the Commissioner of Agriculture of the United States, on the present Agricultural, Mineral and Manufacturing Condition and Resources of the United States. pp. 8. Washington: 1862. The New England Historic Genealogical Society.

AGRICULTURAL SOCIETIES, BOARDS, ETC., *continued.*

United States Department of Agriculture. Office of the Secretary. (*Special Reports*,— *unnumbered*), *continued.*

Report of the Flax and Hemp Commission, appointed under Act of Congress, February 25, 1863. pp. 96; cuts. The New England Historic Genealogical Society.

Reports of the Diseases of Cattle in the United States, made to the Commissioner of Agriculture, with accompanying documents. Half brown morocco, 9.3×.6×6., pp. 190; 1 plate, cuts. Washington: 1869. The family of Hon. Marshall P. Wilder.

Proceedings of the National Agricultural Convention, held at Washington, D. C., February 15–17, 1872. pp. 84. Washington: 1872. The family of Hon. Marshall P. Wilder.

Letter of the Commissioner of Agriculture to the Hon. Jno. W. Johnston, Chairman of the Committee on Agriculture, U. S. Senate, on Sorghum Sugar. pp. 42; 33 plates, 1 chart. Washington: 1880. The New England Historic Genealogical Society.

Preliminary Report of the Department of Agriculture for the year 1880. pp. 155; 2 plates, 1 plan, cuts. Washington: 1881. The New England Historic Genealogical Society.

Report on the Climatic and Agricultural Features and the Agricultural Practice and Needs of the Arid Regions of the Pacific Slope, with notes on Arizona and New Mexico. Made . . . by E. W. Hilgard, T. C. Jones, and R. W. Furnas. 1882. pp. 182. Washington: 1882. The family of Hon. Marshall P. Wilder.

Encouragement to the Sorghum and Beet Sugar Industry. A record of practical experiments conducted under the direction of the Commissioner of Agriculture. pp. 64. Washington: 1883. The New England Historic Genealogical Society.

Special Report. Investigation of Sorghum as a Sugar-producing Plant. Season of 1882. Peter Collier, Chemist. pp. 68; 1 chart, 3 tables. Washington: 1883. The New England Historic Genealogical Society.

Preliminary Report on the Forestry of the Mississippi Valley, and Tree Planting on the Plains. pp. 45. Washington: 1883. The family of Hon. Marshall P. Wilder.

Report on the Organization and Management of Seven Agricultural Schools in Germany, Belgium, and England, made . . . by A. S. Welch, LL.D. pp. 107. Washington: 1885. The New England Historic Genealogical Society.

Agricultural Graphics. A report of Exhibits illustrating Agricultural Statistics at the World's Industrial and Cotton Exposition at New Orleans, La. pp. 42; 27 diagrams. Washington: 1885. The family of Hon. Marshall P. Wilder.

List of Publications of the U. S. Department of Agriculture for the five years 1889–1893, inclusive. pp. 42. Washington: 1894.

Arbor Day: its History and Observance. By N. H. Egleston pp. 80; cuts. Washington: 1896.

Statement in regard to Award of Seed Contract. pp. 8. (Washington: 1896.)

Circulars: —

No. 3. Progress of Southern Agriculture. pp. 12. Washington: 1896.

No. 5. The Civil Service in the Department of Agriculture. pp. 4. Washington: 1896.

Farmers' Bulletins: —

No. 19. (Revised edition). Important Insecticides: directions for their preparation and use. By C. L. Marlatt. pp. 23. Washington: 1895. Thomas Harrison.

No. 33. Peach Growing for Market. By Erwin F. Smith. pp. 23; 21 cuts. Washington: 1895.

No. 34. Meats: Composition and Cooking. pp. 29; cuts. Washington: 1896.

No. 35. Potato Culture. pp. 23; 2 cuts. Washington: 1896.

No. 36. Cotton Seed and its products. pp. 16. Washington: 1896.

No. 37. Kafir Corn: Characteristics, Culture, and Uses. By C. C. Georgeson. pp. 12; 1 cut. Washington: 1896.

No. 38. Spraying for Fruit Diseases. By B. T. Galloway. pp. 12; 6 cuts. Washington: 1896.

No. 39. Onion Culture. By R. L. Watts, B. Agr. pp. 31; 3 cuts. Washington: 1896.

No. 41. Fowls: Care and Feeding. By G. C. Watson, B. Agr., M. S. pp. 24. Washington: 1896.

No. 42. Facts about Milk. pp. 29; cuts. Washington: 1896.

No. 43. Sewage Disposal on the Farm, and the Protection of Drinking Water. pp. 20; cuts. Washington: 1896.

No. 44. Commercial Fertilizers: composition and use. By Edward B. Voorhees, M. A. pp. 24. Washington: 1896.

Section of Foreign Markets: —

Bulletin No. 8. The World's Markets for American Products. Sweden. pp. 92. Washington: 1896.

Circular No. 1. Peaches and other Fruits in England. pp. 3. Washington: 1895.

Circular No. 2. American Dried Apples in the German Empire. pp. 3.

Circular No. 3. Imports and Exports for 1893 and 1894. pp. 4. Washington: 1895.

Circular No. 6. Imports and Exports for 1893, 1894 and 1895. pp. 6.

Circular No. 7. Extension of Markets for American Feed Stuffs. pp. 7.

Circular No. 8. The Manchester District of England as a Market for American Products. pp. 8.

Circular No. 9. Imports and Exports for 1893, 1894, 1895 and 1896. pp. 8.

AGRICULTURAL SOCIETIES, BOARDS, ETC., *continued.*

United States Department of Agriculture. Office of the Secretary. *Section of Foreign markets, continued.*

Circular No. 10. Course of Wheat Production and Exportation in the United States, Canada, Argentina, Uruguay, Russia and British India, from 1880 to 1896. pp. 8.

——— —— —— — ——. Division of Agricultural Soils.

Bulletin No. 1. Soil Moisture. A record of the amount of water contained in soils during the month of May, 1895. pp. 16. Washington: 1895.

Bulletin No. 2. *Same*, June, 1895. pp. 16. Washington: 1895.

Bulletin No. 3. *Same*, July, 1895. pp. 23. Washington: 1895.

Bulletin No. 4. Methods of the Mechanical Analysis of Soils and of the Determination of the Amount of Moisture in Soils in the Field. pp. 24. Washington: 1896.

Bulletin No. 5. Texture of some important Soil Formations. pp. 23; 35 plates. Washington: 1896.

Circular No. 1. (Weather Bureau, Division of Agricultural Soils.) Announcement. pp. 3. Washington: 1894.

Circular No. 2. (Weath. Bur., Div. Agl. Soils.) Instructions for taking Samples of Soil for Moisture Determinations. pp. 3. Washington: 1894.

——— —— —— — -——. Division of Agrostology.

Bulletin No. 1. Notes on Grasses and Forage Plants in the Southeastern States. By Thomas H. Kearney, Jr., Ass't. Agrostologist. pp. 28; 7 cuts. Washington: 1895.

Bulletin No. 2. Fodder and Forage Plants, exclusive of Grasses. By Jared G. Smith, Assistant Agrostologist. pp. 58; 56 cuts. Washington: 1896.

Bulletin No. 3. Useful and Ornamental Grasses. By F. Lamson-Scribner, Agrostologist. pp. 119; 89 cuts. Washington: 1896.

Circular No. 1. A note on Experimental Grass Gardens. pp. 4. Washington: 1895.

Circular No. 2. Hairy Vetch, Sand Vetch, or Russian Vetch. (*Vicia villosa.*) pp. 4; 1 cut. Washington: 1895.

Circular No. 3. Saltbushes. pp. 4; 3 cuts.

——— —— —— — ——. Bureau of Animal Industry.

Tenth and Eleventh Annual Reports of the Bureau of Animal Industry for the years 1893 and 1894. Black cloth, 9.2×.4×5.9, pp. 127. Washington: 1896.

Bulletin No. 6. Additional Investigations concerning Infectious Swine Diseases. pp. 117. Washington: 1894.

Bulletin No. 7. Investigations concerning Bovine Tuberculosis, etc. pp. 78; 6 plates. Washington: 1894.

Bulletin No. 8. Investigations concerning Infectious Diseases among Poultry. pp. 90; 6 plates, colored and plain. Washington: 1895.

Bulletin No. 9. Rules and Regulations governing the Operations of the Bureau of Animal Industry; etc. pp. 46. Washington: 1895.

Bulletin No. 10. Cornstalk Disease, and Rabies in Cattle. pp. 92; 2 plates. Washington: 1896.

Bulletin No. 11. (Dairy No. 1.) Statistics of the Dairy. Compiled from the United States Census for 1890, etc. pp. 53. Washington: 1896.

Bulletin No. 13. Tuberculosis Investigations. pp. 27; 2 plates. Washington: 1896.

Bulletin No. 14. Dairying in California. pp. 31. Washington: 1896.

Circular of Information — No. 2. Wheat as a Food for Growing and Fattening Animals. pp. 4.

Circular No. 5. The Direct Transmission of Infectious Entero-Hepatitis in Turkeys. pp. 8; 7 cuts.

Circular No. 10. (Dairy No. 2.) List of the State Dairy Commissioners and Associations of Dairymen in the United States and Canada for 1896. pp. 6. Washington: 1896.

Circular No. 11. How to select good cheese. pp. 11.

Circular No. 12. Check List of the Animal Parasites of Turkeys. pp. 3. Washington: 1896.

Circular No. 13. Check List of the Animal Parasites of Ducks. pp. 7.

Circular No. 15. Check List of the Animal Parasites of Pigeons. pp. 4.

——— —— —— — ——. Division of Biological Survey. (Formerly *Division of Ornithology and Mammalogy*, which also see.)

Circular No. 17. Bird Day in the Schools. pp. 4.

——— —— —— — ——. Division of Botany.

Contributions from the U. S. National Herbarium. *Vol. III, No. 3.* Issued Sept. 14, 1895. Flora of the Sand Hills of Nebraska. By P. A. Rydberg. pp. v, 133–203; 2 plates, 1 cut. Washington: 1895. *No. 5.* Issued Dec. 14, 1895. (I.) Report on Mexican Umbelliferæ, mostly from the State of Oaxaca, recently collected by C. G. Pringle and E. W. Nelson. By John M. Coulter and J. N. Rose. (II.) Descriptions of Plants, mostly new, from Mexico and the United States. By J. N. Rose. pp. v, 289–323, ii; plates 5–16. Washington: 1895. *No. 6.* Issued Jan. 15, 1896. Botany of Yakutat Bay, Alaska. By Frederick Vernon Coville. With a Field Report, by Frederick Funston. pp. iii, 325–353, ii. Washington: 1895. *No. 7.* Issued April 1, 1896. Preliminary Revision of the North American Species of Echinocactus, Cereus, and Opuntia. By John M. Coulter. pp. iii, 355–462, iv. Washington: 1896. *No. 8.* Issued June 13, 1896. Flora of the Black Hills of South Dakota. By P. A. Rydberg. pp. v., 463–536, iv; plates 17–20. Washington: 1896. *No. 9.* Issued Aug. 5, 1896.

AGRICULTURAL SOCIETIES, BOARDS, ETC., *continued.*

United States Department of Agriculture. Division of Botany, *continued.*

(I.) Flora of Southwestern Kansas. Report on a collection of plants made by C. H. Thompson in 1893. By A. S. Hitchcock. (II.) Crepis occidentalis and its allies. By F. V. Coville. (III.) Plants from the Big Horn Mountains of Wyoming. By J. N. Rose. (IV.) Leibergia, a new genus of Umbelliferæ from the Columbia River Region. By J. M. Coulter and J. N. Rose. (V.) Roseanthus, a new genus of Cucurbitaceæ from Acapulco, Mexico. By Alfred Cogniaux. pp. 537–612, (and title-page and contents to Vol. III, pp. vii); plates 21–28. Washington: 1896.

Bulletin No. 11. Report on the Experiments made in 1889 in the Treatment of the Fungous Diseases of Plants. Prepared by B. T. Galloway. [Section of Vegetable Pathology.] pp. 119; 8 plates. Washington: 1890. W. P. Cutter, Librarian, U. S. Dept. Agriculture.

Bulletin No. 16. American Ginseng: its commercial history, protection and cultivation. By George V. Nash. pp. 22; 2 cuts. Washington: 1895.

Bulletin No. 17. Legislation against Weeds. By Lyster H. Dewey. pp. 60. Washington: 1896.

Circular No. 2. Nut Grass. By Lyster H. Dewey. pp. 4; 1 cut. (Washington: 1894.)

Circular No. 6. Standards of the Purity and Vitality of Agricultural Seeds. By Gilbert H. Hicks. pp. 4.

Circular No. 7. Tumbling Mustard (*Sisymbrium altissimum.*) pp. 8; 3 cuts. Washington: 1896.

Ccular N o. 8. Crimson Clover Hair Balls. By Frederick V. Coville. pp. 4; 3 cuts. Washington: 1896.

——— —— —— — ——. Division of Chemistry.

Bulletin No. 40. Record of Experiments with Sorghum in 1893. By Harvey W. Wiley . . . with the collaboration of Messrs. Oma Carr and C. I. Hinman. pp. 38. Washington: 1894.

Bulletin No. 44. Sweet Cassava: its culture, properties, and uses. By Harvey W. Wiley. pp. 16; 2 plates, 1 cut. Washington: 1894.

Bulletin No. 45. Analyses of Cereals collected at the World's Columbian Exposition, and comparisons with other data. By Harvey W. Wiley, Chief of the Division of Chemistry. pp. 57. Washington: 1895.

Bulletin No. 48. Zinc in Evaporated Apples. pp. 38. Washington: 1896.

(——— —— —— — ——.) United States Entomological Commission. Department of the Interior.

Bulletin No. 7. Insects Injurious to Forest and Shade Trees. By A. S. Packard, Jr., M. D. pp. 275; 100 cuts. Washington: 1881. The family of Hon. Marshall P. Wilder. [2nd copy.]

——— ——— ——— — ———. Division of Entomology.

Bulletin No. 1. New Series. (Revised edition). The Honey Bee: A Manual of Instruction in Apiculture. pp. 118; frontispiece, 11 plates, cuts. Washington: 1896.

Bulletin No. 2. Proceedings of the Seventh Annual Meeting of the Association of Economic Entomologists. pp. 100. Washington: 1895.

Bulletin No. 3. The San Jose Scale: its occurrences in the United States with a full account of its life history and the remedies to be used against it. By L. O. Howard and C. L. Marlatt. pp. 80; frontispiece, cuts. Washington: 1896.

Bulletin No. 4. The Principal Household Insects of the United States. By L. O. Howard and C. L. Marlatt. With a chapter on Insects affecting dry vegetable foods. By H. F. Chittenden. pp. 130; 64 cuts. Washington: 1896.

Technical Series No. 1. Revision of the Aphelininæ of North America. Etc. By L. O. Howard, Entomologist. pp. 44; 14 cuts. Washington: 1895.

Technical Series No. 2. The Grass and Grain Joint-Worm Flies and their allies: a consideration of some North American phytophagic Eurytominæ. By L. O. Howard, Entomologist. pp. 24; 10 cuts. Washington: 1896.

Technical Series No. 3. Revision of the Nematinæ of North America, a subfamily of leaf-feeding Hymenoptera of the family Tenthredinidæ. By C. L. Marlatt. pp. 135; frontispiece, 10 cuts. Washington: 1896.

Circular No. 2, Second Series. The Hop Plant-Louse and the remedies to be used against it. pp. 7; 1 plate, 5 cuts. (Washington): June, 1891.

Circular No. 4. The Army Worm. (*Leucania unipuncta* Haw.) pp. 5; 3 cuts. Washington: 1894.

Circular No. 5. The Carpet Beetle, or "Buffalo Moth." *Anthrenus scrophulariæ* L. pp. 4; 1 cut. Washington: 1894.

Circular No. 6. The Mexican Cotton-Boll Weevil. (*Anthonomus grandis* Boh.) pp. 5; 3 cuts. Washington: 1895.

Circular No. 7. The Pear-Tree Psylla. (*Psylla pyricola* Foerst.) pp. 8; 6 cuts. Washington: 1895.

Circular No. 8. The Imported Elm Leaf-Beetle. (*Galerucella luteola* Mull. (*Galeruca xanthomelæna* Schrank.)) pp. 4; 1 cut. Washington: 1895.

Circular No. 9. Canker-Worms. pp. 4; 4 cuts. Washington: 1895.

Circular No. 10. The Harlequin Cabbage Bug, or Calico Back. (*Murgantia histrionica* Hahn.) 1 sheet, pp. 2. Washington: 1895.

Circular No. 11. The Rose-Chafer. pp. 4. Washington: 1895.

AGRICULTURAL SOCIETIES, BOARDS, ETC., *continued.*

United States Department of Agriculture. Division of Entomology, *continued.*

Circular No. 12. The Hessian Fly. (*Cecidomyia destructor* Say.) pp. 4. Washington: 1895.

Circular No. 13. Mosquitoes and Fleas. pp. 4. Washington: 1896.

Circular No. 14. (Revision of No. 6.) The Mexican Cotton-Boll Weevil. (*Anthonomus grandis* Boh.) pp. 8; 5 cuts. Washington: 1896. [*Also* Spanish translation of same.]

Circular No. 15. General Work against Insects which defoliate shade trees in cities and towns. pp. 4. Washington: 1896.

Circular No. 16. The Larger Corn Stalk-Borer. (*Diatræa saccharalis* Fab.) pp. 3; 3 cuts. Washington: 1896.

Circular No. 17. The Peach-tree Borer. (*Sannina exitiosa* Say.) pp. 4. Washington: 1896.

Bibliography of the more important contributions to American Economic Entomology. Prepared, by authority of the Secretary of Agriculture, by Samuel Henshaw. Part IV. The more important writings of Government and State Entomologists, and of other contributors to the literature of American Economic Entomology. A—K. pp. 167. Washington: 1895.

—— —— —— — ——. Office of Experiment Stations.

The Pathology of Plants. Lines of Investigation that might be undertaken by Experiment Stations. By B. T. Galloway. (From Experiment Station Record, Vol VIII, No. 9.) pp. iii, 725–735. Washington: 1896.

Experiment Station Record. *Vol. 7*, Nos. 4–12. Half green morocco, 9.3×3.×6.5, pp. 261–1092. Washington: 1897. *Vol. 8*, Nos. 1–12. Half green morocco, 9.3×3.×6.5, pp. 1128. Washington: 1897.

Bulletin No. 27. Organization Lists of the Agricultural Experiment Stations and Institutions with Courses in Agriculture in the United States. January, 1896. pp. 93. Washington: 1896.

Bulletin No. 28. The Chemical Composition of American Food Materials. By W. O. Atwater, Ph.D., and Chas. D. Woods, B. S. pp. 47; cuts. Washington: 1896.

Bulletin No 29. Dietary Studies at the University of Tennessee in 1895. By Chas. E. Wait. (With comments by W. O. Atwater and Chas. D. Woods.) pp. 45. Washington: 1896.

Bulletin No. 31. Dietary Studies at the University of Missouri in 1895, and data relating to bread and meat consumption in Missouri. (By H. B. Gibson, S. Calvert, and D. W. May. With comments by W. O. Atwater and Chas. D. Woods.) pp. 24. Washington: 1896.

Bulletin No. 32. Dietary Studies at Purdue University, Lafayette, Indiana, in 1895. (By Winthrop E. Stone. With comments

by W. O. Atwater and Chas. D. Woods.) pp. 28. Washington: 1896.

Circular No. 18. List of Originators of Fruits and Vegetables in the United States, with addresses and names of specialties. pp. 12. Washington: 1891.

Circular No. 25. Canaigre. pp. 4; 1 cut. Washington: 1894.

Circular No. 27. Statistics of Agricultural Colleges and Experiment Stations, 1894. pp. 18. Washington: 1895.

Circular No. 30. Permanent Elements in Experiment Station Work. By A. C. True. pp. 4. Washington: 1896.

——— —— —— — ——. Office of Fiber Investigations.

Report No. 1. A Report on Flax, Hemp, Ramie and Jute, with considerations upon Flax and Hemp Culture in Europe, a Report on the Ramie Machine Trials of 1889 in Paris, and present status of the Fiber Industries in the United States. 2nd ed. pp. 104; 7 cuts. Washington: 1892.

Report No. 7. A Report on the Cultivation of Ramie in the United States, with statements concerning the practice in foreign countries, cost of cultivation and percentages of yield, the machine question, and preparation of the fiber for manufacture. pp. 63; frontispiece, 4 plates, 7 cuts. Washington: 1895.

——— —— —— — ——. Division of Forestry.

Bulletin No. 10. Timber: an elementary discussion of the characteristics and properties of Wood. By Filibert Roth, Special Agent in charge of Timber Physics. pp. 88; 49 cuts. Washington: 1895.

Bulletin No. 11. Some Foreign Trees for the Southern States. pp. 32; 3 plates. Washington: 1895.

Bulletin No. 12. Timber Physics Series. Economical Designing of Timber Trestle Bridges. By A. L. Johnson, C. E. pp. 57. Washington: 1896.

Bulletin No. 13. The Timber Pines of the Southern United States. By Charles Mohr, Ph. D. Together with a Discussion of the Structure of their Wood, by Filibert Roth. Pamph., gray, 12.1×.5×9.6, pp. 160; 27 plates, 18 cuts. Washington: 1896.

Circular No. 8. Strength of "Boxed" or "Turpentine" Timber. pp. 3.

Circular No. 10. Suggestions to the Lumbermen of the United States in behalf of more rational Forest Management. pp. 8.

Circular No. 11. Facts and figures regarding our Forest Resources briefly stated. pp. 8. Washington: 1896.

Circular No. 12. Southern Pine.—Mechanical and Physical Properties. pp. 12. Washington: 1896.

Circular No. 13. Forest Fire Legislation in the United States. pp. 8. Washington: 1896.

Circular No. 14. Is Protection against Forest Fires Practicable? pp. 4.

AGRICULTURAL SOCIETIES, BOARDS, ETC., *continued.*

United States Department of Agriculture. Office of Irrigation Inquiry.

Report of the Special Agent in charge of the Artesian and Underflow Investigations and of the Irrigation Inquiry for 1890. (From the Report of the Secretary of Agriculture for 1890.) pp. 471–488; 1 map. Washington: 1891.

Same for 1891. (From the Report of the Secretary of Agriculture for 1891.) pp. 439–450; 1 map. Washington: 1892.

——— ——— ——— — ———. Library.

Bulletin No. 9. List of Publications of the U. S. Department of Agriculture from 1841—June 30, 1895, inclusive. pp. 76. Washington: 1896. [3 copies—1 bound in half roan.]

Bulletins 10–13, inclusive. February, May, August and October, 1896. Accessions to the Department Library, October, 1895,—September, 1896, (3 months in each Bulletin). pp. 14, 15, 14, and 10.

——— ——— ——— — ———. Division of Ornithology and Mammalogy. (Later *Division of Biological Survey*, which also see.)

Bulletin No. 8. The Jack Rabbits of the United States. pp. 84; frontispiece, 6 plates. Washington: 1896.

North American Fauna. *No. 1.* Oct., 1889. Revision of the North American Pocket Mice. pp. vi, 36; 4 plates. Washington: 1889. *No. 2.* October, 1889. Descriptions of fourteen new species and one new genus of North American Mammals. pp. v, 52; 8 plates. Washington: 1889. *No. 3*, August, 1890. Results of a Biological Survey of the San Francisco Mountain Region and Desert of the Little Colorado, Arizona. pp. vii, 136; 13 plates, colored and plain, 5 colored maps, 2 cuts. Washington: 1890. *No. 4*, October, 1890. Descriptions of twenty-six new species of North American Mammals. pp. v, 60; 3 plates, 3 cuts, 1 table. Washington: 1890. *No. 5*, July, 1891. Results of a Biological Reconnaissance of south-central Idaho. Etc. pp. vii, 132; 4 plates, 4 cuts. Washington: 1891. *No. 8*, January, 1895. Monographic Revision of the Pocket Gophers. Etc. pp. 258; frontispiece, 19 plates, 71 cuts, 4 maps. Washington: 1895.

——— ——— ——— — ———. Division of Pomology.

Report of the Pomologist for 1894. By Samuel B. Heiges. pp. 62; 4 colored plates, 5 cuts. Washington: 1895.

(Special Bulletin.) Nut Culture in the United States. Embracing Native and Introduced Species. Half calf, 11.5×.7×8., pp. 144; 2 colored and 14 plain plates. Washington: 1896.

Circular No. 1. Nut Culture. By H. M. Engle. (Reprinted from Report of the Pomologist for 1894.) pp. 4. Washington: 1894.

Circular No. 2. Prune Culture in the Pacific Northwest. By E. R. Lake. (Reprinted from Report of the Pomologist for 1894.) pp. 7; 3 cuts. Washington: 1894.

Circular No. 3. Notes on Peach Culture. By J. H. Hale. (Reprinted from Report of the Pomologist for 1894). pp. 10; 4 cuts. Washington: 1894.

——— —— —— — ——. Division of Publications.

Index to the Annual Reports of the U. S. Department of Agriculture for the years 1837 to 1893, inclusive. Black cloth, 9.1×.8×6., pp. 252. Washington: 1896.

Circular 179. Price List of Publications of the U. S. Department of Agriculture turned over to the Superintendent of Documents. pp. 15. Washington: 1896.

Monthly Lists of Publications. August to November, 1896. 4 parts. pp. 3, 3, 3, and 4. Washington: 1896.

Notes regarding Department Publications. Circular, 9.3×5.6. Washington: Sept. 19, 1896.

——— —— —— — ——. Office of Road Inquiry.

Bulletin No. 15. Proceedings of the Good Roads Convention of Texas, held in Houston, Feb. 19, 1895. pp. 24. Washington: 1895.

Bulletin No. 17. Historical and Technical Papers on Road Building in the United States. pp. 52; cuts. Washington: 1895.

Bulletin No. 18. State Laws relating to the Management of Roads. Enacted in 1894–95. pp. 86. Washington: 1895. *Supplement.* pp. 5, 87–124. Washington: 1895.

Bulletin No. 20. Traction Tests. pp. 22; 2 plates, 7 cuts. Washington: 1896.

Circular No. 18. Report of Committee on Legislation, adopted by the State Good Roads Convention, held in Richmond, Va., Oct. 10 and 11, 1895. pp. 6.

Circular No. 19. Traffic of the Country Roads. pp. 4. Washington: 1896.

Circular No. 20. Comments on Systems of Maintaining Country Roads. pp. 7. Washington: 1896.

Circular No. 21. Methods of Constructing Macadamized Roads. pp. 12. Washington: 1896.

Circular No. 22. Appeal for the promotion of investigations of this Department regarding public roads, etc. pp. 3. Washington: 1896.

Circular No. 23. Money Value of Good Roads to Farmers. pp. 4. Washington: 1896.

——— —— —— — ——. Division of Statistics.

Reports of the Statistician. New Series. Nos. 133–143. December, 1895 – November, 1896. Washington: 1895, 1896. [Also] Synopses, etc.

A Manual of Instructions to Crop Correspondents. New edition. pp. 23. Washington: 1896.

AGRICULTURAL SOCIETIES, BOARDS, ETC., *continued.*

United States Department of Agriculture. Division of Statistics, *continued.*

Miscellaneous Series. *Bulletin No. 9.* Production and Price of Cotton for one hundred years. pp. 16. Washington: 1895. *No. 10.* Railway Charges for the Transportation of Wool. July, 1896. pp. 30. Washington: 1896. *No. 11.* Number and Value of Farm Animals of the United States, and Animal Products. 1880–1896. pp. 63. Washington: 1896.

Circular No. 1. Acreage, Production and Value of Principal Farm Crops in the United States, 1866–1895, with other data as to Cotton and Wool. pp. 8. Washington: 1896.

Circular No. 2. The Wheat Crop of the World. 1 sheet, 9.4× 5.8. [Repr. from Statistician's Report, March 1896.] Washington: 1896.

——— —— —— — ——. Division of Vegetable Physiology and Pathology.

Bulletin No. 8. The Principal Diseases of Citrous Fruits in Florida. By Walter T. Swingle and Herbert J. Webber. pp. 42; 8 plates, colored and plain, 6 cuts. Washington: 1896.

Bulletin No. 9. Bordeaux Mixture: its chemistry, physical properties, and toxic effects on Fungi and Algæ. By Walter T. Swingle. pp. 37. Washington: 1896.

Bulletin No. 10. Copper Sulphate and Germination. Treatment of Seed with Copper Sulphate to prevent the attacks of Fungi. By Walter H. Evans, Ph. D. pp. 24. Washington, 1896.

Bulletin No. 11. Legal Enactments for the Restriction of Plant Diseases. A Compilation of the Laws of the United States and Canada. By Erwin F. Smith. pp. 45. Washington: 1896.

Bulletin No. 12. A Bacterial Disease of the Tomato, Eggplant, and Irish Potato. (*Bacillus solanacearum* n. sp.) By Erwin F. Smith. Issued December 19, 1896. pp. 26, (1); 2 plates (one colored.) Washington: 1896.

Circular No. 6. (Botanical Division, Section of Vegetable Pathology.) Treatment of Black Rot of the Grape. pp. 3. [2d copy.]

Circular No. 8. Experiments in the Treatment of Pear Leaf-Blight and the Apple Powdery Mildew. pp. 11; 2 cuts. Washington: 1889. [2d copy.]

——— —— —— — ——. Weather Bureau.

Bulletin No. 13. Temperatures injurious to Food Products in Storage and during Transportation, and methods of protection from the same. pp. 20. Washington: 1894.

Bulletin No. 14. Report of the Third Annual Meeting of the American Association of State Weather Services coöperating with the Weather Bureau, U. S. Department of Agriculture. pp. 31. Washington: 1894.

Bulletin No. 16. The Determination of the Relative Quantities of Aqueous Vapor in the Atmosphere by means of the Absorption Lines of the Spectrum. pp. 12; 1 plate, 1 table. Washington: 1896.

Bulletin No. 17. The Work of the Weather Bureau in connection with the rivers of the United States. pp. 106; 3 charts, 1 cut. Washington: 1896.

Bulletin No. 18. Report of the Fourth Annual Meeting of the American Association of State Weather Services, coöperating with the Weather Bureau, U. S. Department of Agriculture, held at Indianapolis, Ind., Oct. 16 and 17, 1895. pp. 55. Washington: 1896.

Special Report of the Chief of the Weather Bureau to the Secretary of Agriculture. 1891. Summary of the operations of the Bureau during the three months immediately following its transfer to the Department of Agricnlture, *i. e.* July 1 to October 1, 1891. pp. 26; cuts. Washington: 1891. [2d copy.]

Circular A, Instrument Room. Revised edition. Instructions for obtaining and transcribing records from recording instruments. pp. 40; 3 cuts. Washington: 1894.

Circular B, Instrument Room. Revised edition. Instructions for use of Maximum and Minimum Thermometers. pp. 16; 8 cuts. Washington: 1895.

Circular C, Instrument Room. Revised edition. Instructions for use of the Rain Gauge. pp. 11; 3 cuts. Washington: 1895.

Circular D, Instrument Room. Anemometry. A circular of general information respecting the theory and operation of typical instruments for indicating, measuring, and automatically recording wind movement and direction, etc. pp. 40; 18 cuts. Washington: 1893.

Circular E, Instrument Room. Instructions for using Marvin's Weighing Rain and Snow Gauge. pp. 16; 5 cuts. Washington: 1893.

Circular F, Instrument Room. Barometers and the measurement of Atmospheric Pressure. Etc. pp. 74; 24 cuts. Washington: 1894.

Circular G, Instrument Room. Instructions for use of Combined Maximum and Minimum Soil Thermometers. pp. 8; 2 cuts. Washington: 1894.

Circular H, Instrument Room. Instructions for the use of Maximum and Minimum Radiation Thermometers, pp. 10; 5 cuts. Washington, 1894.

Instructions for Voluntary Observers. pp. 100; 21 cuts. Washington: 1892.

Daily River Stages at River-Gauge Stations on the Principal Rivers of the United States for the years 1890, 1891, 1892. Part IV. pp. lxvii. Washington: 1893.

AGRICULTURAL SOCIETIES, BOARDS, ETC., *continued.*

United States Department of Agriculture. WEATHER BUREAU, *continued.*

Instructions for using Glass Electrical Sunshine Recorder. Pattern 1893. pp. 4.

Instructions to Special Rainfall Observers. pp. 22; 2 cuts. Washington: 1893.

Instructions to Special River Observers of the Weather Bureau. pp. 49; 7 cuts. Washington: 1894.

Instructions to Observers and Code for Enciphering Reports at the Cotton-Region and Sugar and Rice Stations of the Weather Bureau. pp. 39; 10 cuts. Washington: 1895.

Monthly Weather Review. *Vol. 23*, Nos. 8–12, August to December, 1895, and No. 13, Annual Summary for 1895. *Vol. 24.* Nos. 1–10, January to October, 1896. 16 pamphs., gray, 12.5×.1×10., charts. Washington: 1895 and 1896.

Annual Summary of the New England Weather Service for the year 1894. (Reprinted from the Annals of the Astronomical Observatory of Harvard College, Vol. XLI,—No. III.) Pamph., tea, 12.×.1×10., pp. 63–93; plate III. Cambridge, Mass.: 1895.

Same, for 1895. (Repr. Ann. Astron. Observ. Harv. Coll., Vol. XLI,—No. IV). pp. 95–131; 1 chart. Cambridge, Mass.: 1896. J. W. Smith, Director Weather Bureau, Boston, Mass.

New England Section of the Climate and Crop Service of the Weather Bureau. Report for 1896. pp. 7; 2 charts. Washington: 1896.

Bulletins of the New England Weather Service for the months of December, 1895 and January, 1896, Nos. 46 and 47. 2 pamphs., 11.×8.

(Bulletins of the) New England Section of the Climate and Crop Service. Vol. I, Nos. 1–10, February to November, 1896. 10 pamphs., 12.3×9.5. [Continuation of New England Weather Service Bulletins.]

Weekly Weather-Crop Bulletins of the New England Weather Service. Nos. 1–23. From the week ending April 27, to the week ending September 29, 1896, inclusive. 23 sheets, 14.×8.6.

Climate and Crop Service of the Weather Bureau, North Carolina Section. Announcement, Oct. 1st. 1896. Broadside, 10.8×8.3.

Society for the Promotion of Agricultural Science. Proceedings of the Seventeenth Annual Meeting, held at Buffalo, N. Y., 1896. Pamph., salmon-color, 9.2×.2×5.7, pp. 114; portrait, 3 plates, cuts. C. S. Plumb, Secretary.

Nova Scotia, Secretary for Agriculture. Annual Report for the year 1895. Pamph., blue, 9.6×.3×6.4, pp. v, 208. Halifax: (1896). B. W. Chipman, Secretary for Agriculture.

Nova Scotia. Provincial Government Crop Report, November, 1896. Pamph., 8.2×.1×5.6, pp. 65.

The Montreal Exhibition and Eastern Farmers' Carnival. Fifth Provincial Exhibition. Sept. 11–19, 1896. Prize List, Rules, and Regulations. Pamph., pale green, 8.6×.1×5.7, pp. 83. S. C. Stevenson, Manager and Secretary.

Ontario Department of Agriculture. Bureau of Industries for the Province of Ontario. (10th) Annual Report, 1891, parts IV and V. pp. 32. Toronto: 1892. (12th) Annual Report, 1893, parts IV and V. pp. 33. Part VI. pp. 103. Toronto: 1894. (13th) Annual Report, 1894, parts IV and V. pp. 32. Part VI. pp. viii, 168. Toronto: 1895. (14th) Annual Report, 1895, parts I–III. pp. viii, 148. Toronto: 1896. 6 pamphs., salmon-color, 9.5×.1–.3×6.5. C. C. James, Secretary.

Bulletins 57–60. Crops and Livestock in Ontario. 4 pamphs., 7.7×—×5. Toronto: (1896). The Ontario Department of Agriculture.

Ontario, Farmers' Institutes of the Province of. Report of the Superintendent. 1895–6. (Published by the Ontario Department of Agriculture, Toronto.) Pamph., salmon-color, 9.7×.4×6.5, pp. iv, 248; cuts. Toronto: 1896. The Ontario Department of Agriculture.

Ontario, Live Stock Associations of the Province of. Annual Reports. 1895–6. Pamph., salmon-color, 9.7×.3×6.5, pp. iv, 166; cuts. Toronto: 1896. The Ontario Department of Agriculture.

Ontario, Dairymen's and Creameries' Associations of the Province of. Annual Reports. 1895. Pamph., salmon-color, 9.7×.5×6.5, pp. iv, 272. Toronto: 1896. The Ontario Department of Agriculture.

Ontario Department of Agriculture. Road Bulletins. Nos. 1 and 2. 2 pamphs., 8.7×—×5.9, pp. 3 and 15. Toronto: (1896.) The Ontario Department of Agriculture.

New Hampshire State Agricultural Society. Transactions. 1850–1854. 5 vols. bound in 3, black cloth, 8.7×1.1–1.4×5.5, pp. 400, 400, 400; frontispieces, plates, cuts. Concord: 1853–1855. L. A.

New Hampshire Board of Agriculture, Second Annual Report of the, to His Excellency the Governor, May 1, 1872. Prepared by James O. Adams, Secretary. Black cloth, 9.1×1.5×5.8, pp. 490, (1); portrait, plates, cuts. Manchester: 1872. The family of Hon. Marshall P. Wilder.

Vermont State Board of Agriculture. Twelfth Report, 1891–92. Black cloth, 9.×1.×6., pp, 399. Burlington, 1892. W. W. Cooke, Secretary.

Massachusetts State Board of Agriculture. Forty-third Annual Report of the Secretary, together with the Eighth Annual Report of the Hatch Experiment Station of the Massachusetts Agricultural College. 1895. Black cloth, 9.1×1.8×6.1, pp. xxviii, 566, 190; 1 colored and 2 plain plates, 1 map, cuts. Boston: 1896. Hon. William R. Sessions, Secretary, State Board of Agriculture.

AGRICULTURAL SOCIETIES, BOARDS, ETC., *continued.*

——— —— —— — ——. Crop Reports for the months of May to October, 1896. Bulletins 1–6. Issued by William R. Sessions, Secretary, State Board of Agriculture. 6 pamphs., 9.×.1×5.5. Boston: 1896. The Secretary.

——— —— —— — ——. Directory of the Agricultural and Similar Organizations in the State. February, 1896. Pamph., 9.2×—×5.8, pp. (395)–409. Hon. Williams R. Sessions, Secretary, State Board of Agriculture.

——— —— —— — ——, Regulations of the, concerning Farmers' Institutes, with a list of available lecturers, and their subjects. Issued by the Secretary of the Board of Agriculture by vote of the Committee on Agricultural College and Education. November 10, 1896. Pamph., 9.2×—×5.8, pp. 10. Boston: 1896. Hon. William R. Sessions, Secretary.

Bay State Agricultural Society. Joint Exhibition with the Worcester Agricultural Society, Sept. 1–4, 1896, at the grounds of the Worcester Society. Official Schedule of Premiums. Pamph., gray, 7.7× .1×4.7, pp. 72. J. D. W. French.

Bussey Institution (Harvard University). Bulletin. Vol. II, part V. 1896. Facts gathered by observation and experience relating to the White Pine (*Pinus Strobus*, L.) Pamph., blue, 9.2×—×5.9, pp. 373–385. Cambridge: 1896. The Institution.

Amesbury and Salisbury Agricultural and Horticultural Society. Premium List for the year 1896, with the Constitution and By-Laws, and the Secretary's and Treasurer's Reports, of the Thirty-second Annual Fair, Amesbury, Sept. 24–26, 1895. Pamph., pale blue, 9.1×.1×5.8, pp. 46. Amesbury: 1896. A. H. Fielden, Secretary.

Barnstable County Agricultural Fair, Sept. 15-17, 1896. List of Premiums. Pamph., gray, 9.×—×5.8, pp. 29. Hyannis, Mass., 1896. Barnstable County Agricultural Society.

Berkshire Agricultural Society. Transactions for 1895, and list of Premiums for Eighty-seventh Annual Exhibition, Sept. 15–17, 1896. Pamph., olive, 9.3×.2×5.9, pp. 26, 39. Pittsfield, Mass.: 1896. The Society.

Blackstone Valley Agricultural Society. Thirteenth Annual Fair, Sept. 29 and 30, 1896. Premium List. Pamph., green, 7.2×—×4.4, pp. 23. Uxbridge, Mass.: 1896. The Society.

Bristol County Agricultural Society. Seventy-third Annual Exhibition, Sept. 22–24, 1896. Premium List. Pamph., 7.4×—×4.7, pp. 21. The Society.

Deerfield Valley Agricultural Society. Programme of the Twenty-sixth Annual Cattle Show and Fair held at Charlemont, Sept. 17 and 18, 1896. Pamph., 7.2×—×3.2. pp. 12. S. W. Hawkes, Secretary.

Eastern Hampden Agricultural Society. Premium List of the Forty-fourth Annual Exhibition, Palmer, Mass., Sept. 22 and 23, 1896. Pamph., green, 7.5×—×4.5, pp. 31. Palmer, Mass.: 1896. F. D. Barton, Secretary and Treasurer.

Essex Agricultural Society. Arrangements, Premiums and Committees for the Seventy-sixth Annual Exhibition at Peabody, Sept. 22–24, 1896. Pamph., gray. 7.4×—×4.5, pp. 41. John M. Danforth, Secretary.

Franklin County Agricultural Society. Premium List and Programme of the Forty-seventh Annual Cattle Show and Fair, at Greenfield, Mass., Sept. 24 and 25, 1896. Pamph., fawn-color, 5.9×—×3.1, pp. 24. William S. Allen, Secretary.

Hampden County Fair, to be held at Westfield, Mass., Sept. 24 and 25, 1896. Premium List. Pamph., tea, 6.8×—×4.4, pp. 28. Westfield, Mass.: 1896. William H. Foote, Secretary.

Hampshire County Agricultural Society. Premium List for Forty-seventh Annual Cattle Show and Fair, Amherst, Mass., Sept. 29–30, 1896. Pamph., 5.3×—×3., pp. 15. The Society.

Hillside Agricultural Society. Transactions for the year 1895. Also General Arrangements for the Twenty-eighth Annual Exhibition of the Society at Cummington, September, 1896. Pamph., fawn-color, 8.8×—×5.9, pp. 36. West Cummington, Mass.: 1896. Wm. G. Atkins, Secretary.

Hingham Agricultural and Horticultural Society. Transactions for the year 1895. Pamph., flesh-color, 9.2×.2×5.8, pp. 88, (4). William H. Thomas, Secretary.

Hoosac Valley Agricultural Society. Thirty-sixth Annual Report. Transactions, 1895, and Premium List, 1896. Pamph., buff, 8.9×.2×5.7, pp. 99, 46. North Adams, Mass.: 1896. The Society.

Housatonic Agricultural Society, Great Barrington, Mass. Transactions, 1895 and Premium List, 1896. Pamph., pink, 9.2×.1×5.8, pp. 79. The Society.

Marshfield Agricultural and Horticultural Society. Transactions during the year 1895. Containing List of Premiums during the year 1896. Pamph., buff, 8.8×.1×5.6, pp. 24. Plymouth: 1896. Francis Collamore, Secretary.

Middlesex South Agricultural Society. Transactions for 1895. With the Premium List, the Committees, and the Regulations for the Exhibition of 1896. Pamph., blue, 9.×—×5.8, pp. 24. South Framingham, Mass.: 1895. Geo. C. Blades, Secretary.

Nantucket Agricultural Society. List of Premiums offered for its Forty-first Cattle Show and Fair, Sept. 2–3, 1896. Pamph., fawn-color, 8.6×—×6.8, pp. 17. Nantucket: 1895. The Society.

Oxford (Mass.) Agricultural Society. Annual Cattle Show and Exhibition of Horses, Poultry, Fruits, Flowers, Vegetables, etc. Sept. 22–23, 1896. Premium List. Pamph., blue, 9.×—×5.6, pp. 17. The Society.

Plymouth County Agricultural Society. List of Premiums, 1896. Pamph. blue, 8.2×.1×5.5, pp. 25. The Society.

Spencer Farmers' and Mechanics' Association. Eighth Annual Report with premiums offered for 1896. Pamph., salmon-color, 7.6×.2×5.1, pp. 98. Spencer, Mass.: 1896. The Association.

AGRICULTURAL SOCIETIES, BOARDS, ETC., *continued.*

Weymouth Agricultural and Industrial Society. Transactions during the year 1895. Pamph., yellow, 8.4×.1×5.8, pp. 45. Weymouth: 1896. H. W. Dyer, Secretary.

Worcester County West Agricultural Society. Transactions for 1895, and Premium List and Regulations for 1896. Pamph., drab, 9.× .1×5.9, pp. 66. Barre, Mass.: (1896.) The Society.

Worcester East Agricultural Society. Transactions for 1895. With list of Committees and Premiums for 1896. Pamph., gray, 9.2×.1×5.7, pp. 44. Clinton: 1896. The Society.

Worcester North Agricultural Society. Transactions for the year 1895, together with a list of the Committees and Premiums for 1896. Pamph., gray, 9.×.2×5.9, pp. 76. Fitchburg: 1896. John W. Ogden, Secretary.

Worcester Northwest Agricultural and Mechanical Society. Official List of Premiums arranged by the Trustees for the (Thirtieth) Annual Fair, (at Athol), Oct. 6 and 7, 1896. Pamph., blue, 7.×.2×5., pp. 64. Athol, Mass. J. H. Humphrey, Secretary.

Worcester South Agricultural Society. Forty-first Annual Report for 1895 and Premium List for 1896. Pamph., pink, 8.9×.1×5.7, pp. 59. Southbridge: 1895. The Society.

Rhode Island State Board of Agriculture. Tenth Annual Report made . . . January, 1895. Black cloth, 9.2×1.3×6.2, pp. 505; portrait, plates, map. Providence: 1895. George A. Stockwell, Secretary.

Eleventh Annual Report, made January, 1896. Black cloth, 9.2×1.4×6.4, pp. 472, 63; portrait, plates, 1 map. Providence: 1896. George A. Stockwell, Secretary. [10 copies.]

Connecticut Board of Agriculture. Twenty-ninth Annual Report of the Secretary, 1895. Black cloth, 9.1×1.9×6.3, pp. 258, xx, 320, 216, 21; plates, cuts. Hartford: 1896; New Haven: 1896; and Middletown: 1896. T. S. Gold, Secretary.

New York State Dairy Commissioner. Eighth Annual Report for the year 1891. Dark green cloth, 9.2×1.2×5.9, pp. 518, cuts. Albany: 1892.

Ninth Annual Report for the year 1892. Green cloth, 9.1×1.8×6., pp. 898; 1 portrait. Albany: 1893.

New York State Department of Agriculture. First Annual Report of the Commissioner of Agriculture for the year 1893. Vol. I. pp. 814. Albany: 1894.

Second Annual Report for 1894. Vol. I, pp. 1360. Vol. II, Sixth Annual Report of the New York Weather Bureau, 1894. pp. 317; also Seventh Annual Report of the Agricultural Experiment Station, Ithaca, N. Y., 1894. pp. 702; cuts. Vol. III., Thirteenth Annual Report of the Board of Control of the New York Agricultural Experiment Station, Geneva, for the year 1894. pp. 806; cuts. Albany: 1895.

4 vols., green cloth, 9.3×1.5–2.6×6. C. A. Wieting, Commissioner.

Ohio State Board of Agriculture. Twenty-second and Thirty-fifth to Fiftieth Annual Reports. For the years 1867 and 1880 to 1895, inclusive. 17 vols., black cloth, 9.8×1.4–3.3×7. Columbus, (and Norwalk, 48th): 1868 and 1881–1896. W. W. Miller, Secretary.

Illinois State Board of Agriculture. Statistical Reports 171–173, Dec. 1, 1895, May 1 and June 20, 1896. Summaries of the Reports of Correspondents as to the Condition and Yield of the Crops, Live Stock, Fruit, etc., made to the Illinois State Board of Agriculture. 3 pamphs., yellow, 8.9×.2×5.8, pp. 90, 32 and 30. Springfield: 1895, 1896. W. C. Garrard, Secretary.

Michigan State Board of Agriculture. Thirty-first Annual Report of the Secretary, July 1, 1891 to June 30, 1892. pp. 607; portrait, cuts. Lansing: 1892.

Thirty-third Report, 1893–'94. pp. 531; frontispiece, plates, cuts, table. Lansing: 1894.

Thirty-fourth Report, 1894–'95. pp. (2), 900; portrait, plan, cuts. Lansing: 1896.

3 vols., black cloth, 9.5×1.3–1.8×6.5. I. H. Butterfield, Secretary.

Missouri State Board of Agriculture. Thirteenth Annual Report, for the year 1878. pp. 351, v.

Fifteenth Annual Report for the years 1880 and 1881. pp. 426.

Twenty-third Annual Report for the years 1890–91. pp. 787, xxiv; plates, cuts, chart.

Twenty-fifth Annual Report for the year 1892. pp. 363, ii.

Twenty-seventh Annual Report, for the year 1894. pp. 368, iii.

Twenty-eighth Annual Report for the year 1895. pp. 387, iv; plates, cuts, charts.

2 pamphs., 4 vols., cloth., 8.8–9.5×.8–1.8×6.5. Jefferson City: 1879, 1881, 1891, 1893, 1895 and 1896. J. R. Rippey, Secretary.

Kansas State Board of Agriculture. Fifth Biennial Report, 1885–86. pp. 604, 237; frontispiece, maps, diagrams, etc. Topeka: 1887.

Sixth Biennial Report, 1887–88. pp. 546, 258; frontispiece, maps, diagrams, etc. Topeka: 1889.

Seventh Biennial Report, 1889–90. pp. 282, 260; frontispiece, plates, cuts, etc. Topeka: 1891.

Ninth Biennial Report. 1893–94. pp. 537; plates, cuts, map, etc. Topeka: 1895.

4 vols., cloth, 9.4×1.2–2.3×6.5.

—— —— —— — ——. Report for the year ending December 31, 1893. Pamph., fawn-color, 9.1×.2×6., pp. 110. Topeka: 1894.

—— —— —— — ——. Report for the month ending June 30, 1894. pp. 57; 3 charts.

Report for the month ending Dec. 31, 1895. pp. 136.

2 pamphs., fawn-color, 8.9×.1–.3×6. Topeka: 1894, 1895.

AGRICULTURAL SOCIETIES, BOARDS, ETC., *continued.*

——— —— —— — ——. Report for the quarter ending Dec. 31, 1885. pp. 190; 1 map.

For quarter ending March 31, 1894. pp. 148, (1); cuts.
" " " Sept. 30, 1894. pp. 207; cuts.
" " " March 31, 1895. pp. 216; plates, chart.
" " " " " 1896. pp 230; cuts.
" " " Sept. 30, 1896. pp. 264; plates, cuts.

6 pamphs., fawn-color, etc. Topeka: 1886–1896.

F. D. Coburn, Secretary.

Louisiana Department of Agriculture. Condition and Prospect of Crops. Reports of Parish Correspondents. Circulars 1–7, January to December, 1896. 7 pamphs., 9.×—×6. Baton Rouge: 1896. A. V. Carter and J. G. Lee, Commissioners.

Colorado State Board of Agriculture. Annual Report, 1890. pp. 106, Denver: 1891.

Annual Report, 1891. pp. 88. Fort Collins: 1892.
" " 1892. pp. 29. Denver: 1893.
" " 1893. pp. 78, (2); frontispiece, cut. Fort Collins: 1894.

4 pamphs., fawn-color, etc. Daniel W. Working, Secretary.

——— —— —— — and the State Agricultural College. Sixteenth Annual Report, 1894. pp. 68, (1). Denver: 1894.

Seventeenth Annual Report, etc. 1895. pp. 164. Denver: 1896.

2 pamphs., pink, straw-color, 9.×.1–.4×5.8. Daniel W. Working, Secretary.

——— —— —— — ——, the State Agricultural College and the Agricultural Experiment Stations, Laws relating to the. In force August 1st, 1894. Compiled by authority and under direction of the State Board of Agriculture. Pamph., buff, 9.×.1×6., pp. 58, (1). Fort Collins: 1894. Daniel W. Working, Secretary State Board of Agriculture.

Colorado, Agricultural Statistics of the State of. 1883, 1886, 1892, and 1893. Compiled by the Secretary of the State Board of Agriculture. 4 pamphs., gray, pink, etc., 8.8×—×5.8, pp. 16, 30, 8, and 23. Denver: 1884, 1888, 1894 and 1895. Daniel W. Working, Secretary.

Leeward Islands Gazette, Supplement to the. 27th August, 1896. Report on the cultivation of different varieties of Sugar Cane at Skerrett's Farm, with the view of ascertaining which varieties are best able to resist disease. By F. Watts and F. R. Shepherd. Pamph., 13.2×—×8.4, pp. (7). The Department of Agriculture, St. John's, Antigua.

Leeward Islands. Report on the Sugar Industry in Antigua. By Francis Watts. Pamph., dull green, 11.1×—×8., pp. 10. The Department of Agriculture, St. Johns, Antigua.

Timehri: Being the Journal of the Royal Agricultural and Commercial Society of British Guiana. New Series. Vol. IX, Part II, December, 1895. Edited by James Rodway, F. L. S. pp. 207–393. Demerara: (1895.)

Vol. X, Part 1, June 1896. pp. 222; 1 plate. Demerara: 1896. 2 parts, light green paper, 8.6×.6×5.5. S. F.

Sociedad Rural Argentina, Anales de la. Vol. 30, 1896. 9 pamphs., blue, 11.×—×7.5, pp. 280; cuts. Buenos Aires. [1896.] The Society.

Asociacion Rural del Uruguay. Revista. Vol. 25, 1896. 24 pamphs., 10.3×—×7.1, pp. 607. Montevideo: 1896. The Association.

—— —— — —. Primer Congreso Ganadero-Agricola celebrado por la. Marzo y Abril de 1895. Pamph., yellow, 9.7×1.1×6.7, pp. xxxii, 494; 1 plate. Montevideo: 1896. The Association.

Royal Agricultural Society of England. Journal. Third Series. *Vol. 6*, part IV.—No. 24, 31st December, 1895. pp. viii, viii, 621–808, clxiii–cxciv; cuts. London: 1895.

Vol. 7, parts 1–3, Nos. 25–27, 31st March, 30th June and 30th September, 1896. pp. 600, clx; cuts. London: 1896. 4 parts, blue paper, 8.4×.6×5.4. S. F.

Scotland, Highland and Agricultural Society of. Transactions, with an abstract of the Proceedings at board and general meetings, and the Premiums offered by the Society in 1896. Fifth Series. Vol. VIII, with Index to Volumes I–VII. Edited by James Macdonald, F. R. S. E., Secretary to the Society. Blue cloth, 9.×1.4×5.9, pp. iv, 442, 87, iii, 35. Edinburgh: 1896. S. F.

County Cork Agricultural Society, Publications of the. No. VI. General Report of Experiments on Potato Culture made under the auspices of the Society, at the Munster Dairy School Farm, in the years 1880, 1881, 1882 & 1883. By W. K. Sullivan, Ph.D., D.Sc., President of Queen's College, Cork. Pamph., green, 8.5×.1×5.5, pp. 25, (31). Cork: 1884. J. D. W. French.

Queensland Department of Agriculture, Brisbane.

Bulletin No. 8, February, 1891. Recent Experiments made at the American Agricultural Experiment Stations. Edited by E. M. Shelton, Instructor in Agriculture. pp. 24. Brisbane: 1891.

Bulletin No. 11, September, 1891. Suggestions for Building a Cool Dairy. pp. 4; 3 plates. Brisbane: 1891.

Bulletin No. 16, January, 1892. The Establishment of Creameries; Insecticides; Manures and their preservation; Ramie Culture; Clarifying Re-agent in Sugar Making; and Potato Trials. Excerpts from reports of American Experiment Stations with notes and comments on the same. By E. M. Shelton. pp. 27; cuts, 3 diagrams. Brisbane: 1892.

Bulletin No. 21, February, 1893. Botany Bulletin No. VII. Contributions to the Queensland Flora. By F. M. Bailey, F. L. S., Colonial Botanist. pp. (2), 59–69. Brisbane: 1893.

AGRICULTURAL SOCIETIES, BOARDS, ETC., *continued.*

Bulletin No. 4, *second series*, October, 1894. The Disease affecting the Orange Orchards of Wide Bay, and the Insect Pests prevalent therein. By Henry Tryon, Entomologist. pp. 17. Brisbane: 1894.

Bulletin No. 6. Wheat-Growing Experiments, with Observations on the general subject of wheat-growing in Queensland. By E. M. Shelton. pp. 30. Brisbane: 1895.

Bulletin No. 7, July, 1895. The Use of Maize as Human Food. Introductory Article by E. M. Shelton. Recipes selected by Mrs. Shelton. pp. 16. Brisbane: 1895.

Bulletin No. 8. Practical Poultry Farming. By Mrs. Lance Rawson. pp. 44. Brisbane: 1896.

Bulletin No. 9. Dairying. By John Mahon. pp. 39. Brisbane: 1896.

Bulletin No. 10. Report on the Olive Tree and Olive Oil of Tuscany. By Major Chapman. pp. 7. Brisbane: 1896.

Bulletin No. 11, September, 1896. Soil Wastes in the Cane Field. By E. M. Shelton. pp. 19. Brisbane: 1896.

Botany Bulletin No. XIII, April 1896. Contributions to the Queensland Flora. By F. M. Bailey, F. L. S., Colonial Botanist. pp. 80; 4 plates. Brisbane: 1896.

Botany Bulletin No. XIV, October, 1896. Contributions to the Queensland Flora. By F. M. Bailey. pp. 16; 6 plates. Brisbane: 1896.

12 pamphs., 8.5×.1×5.5. The Department of Agriculture, Brisbane, Queensland.

New South Wales. The Agricultural Gazette of. Published by the Department of Agriculture. Vol. VII. January — November, 1896. Dark blue cloth, 9.6×2.8×6.4, pp. xix, 828; plates, cuts. Sydney: 1897. The Director of the Department of Agriculture, N. S. W.

AGRICULTURAL EXPERIMENT STATIONS, ETC.

The following Bulletins and Reports have been received during the year from the Agricultural Experiment Stations of the United States and Canada, and are presented by the directors of the respective stations.

ALABAMA.— Bulletins 66–72. Eighth Annual Report, for 1895.

ARIZONA.— Bulletins 15–21.

ARKANSAS.— Bulletins 37–42.

CALIFORNIA.— Bulletins 109–112. Report for the year 1894–95.

COLORADO.— Bulletins 33 and 34. Eighth Annual Report, for 1895.

CONNECTICUT. (*New Haven Station*).— Bulletins 122 and 123. Nineteenth Annual Report, for 1895.

(*Storrs Station*).— Bulletins 16 and 17. Eighth Annual Report, for 1895.

DELAWARE.— Bulletins 29–33. Seventh Annual Report, for eighteen months closing June 30, 1895.

FLORIDA.— Bulletins 30–35.

GEORGIA.— Bulletins 29–32. Eighth Annual Report, for 1895.

IDAHO.— (Third) Annual Report, for 1895.

ILLINOIS.— Bulletins 41–45. Seventh and Eighth Annual Reports, for 1893–94 and 1894–95.

INDIANA.— Bulletins 57–60. Special Bulletin, 2 editions. Seventh and Eighth Annual Reports, for 1894 and 1895.

IOWA.— Bulletins 32 and 33.

KANSAS.— Bulletins 54–61. Eighth Annual Report, for 1895.

KENTUCKY.— Bulletins 59–64. Seventh and Eighth Annual Reports, for 1894 and 1895.

LOUISIANA.— Bulletins 38–44. Seventh and Eighth Annual Reports, for 1894 and 1895.

MAINE.— Bulletins 15–25. Annual Report for 1894.

MARYLAND.— Bulletins 37–42. Eighth Annual Report, for 1895.

MASSACHUSETTS.— Bulletins 35–42. Eighth Annual Report, for 1895.

Meteorological Division.— Bulletins 84–95.

MICHIGAN.— Bulletins 129–134. Eighth Annual Report, for 1895.

MINNESOTA.— Bulletins 42–47. Annual Report for 1894.

Northwest Weather and Crops.— Vol. I, Nos. 9 and 10.

MISSISSIPPI.— Bulletins 36–39. Seventh and Eighth Annual Reports, for 1894 and 1895.

MISSOURI.— Bulletin 31.

MONTANA.— Bulletins 7–10. Second Annual Report, for 1894–95.

NEBRASKA.— Bulletins 42–44. Ninth Annual Report, for 1895.

NEVADA.— Bulletins 28–31.

NEW HAMPSHIRE.— Bulletins 30–39. Sixth Annual Report, for 1893–94. (Seventh Annual Report, for 1894–95 = Bulletin 31.)

NEW JERSEY.— Bulletins 115–116. Sixteenth Annual Report of the State Station, and Eighth Annual Report of the College Station, for 1895.

NEW MEXICO.— Bulletins 14–19. Fourth and Fifth Reports of the Morrill Fund, for 1893–94 and 1894–95. Fifth and Sixth Reports of the Experiment Station, for 1893–94 and 1894–95. Fourth, Fifth, and Sixth Reports of the College of Agriculture, for 1893, 1894, and 1895. Fourth and Fifth College Catalogues, for 1893–94 and 1894–95.

NEW YORK. (*State Station.*)— Bulletins 95–108.

(*Cornell University Station*).— Bulletins 104–121. Seventh Annual Report, for 1894.

AGRICULTURAL EXPERIMENT STATIONS, ETC., *continued.*

North Carolina.— Bulletins 117–131.

Special Bulletins 24, 31–38.

Meteorological Division.— Bulletins 75–83. Ninth Annual Report, for 1895.

Weekly Weather Crop Bulletins, 1–25, for 1895.

North Dakota.— Bulletins 21–23.

Ohio.— Bulletins 62–72.

Oklahoma.— Bulletins 14–19.

Oregon.— Bulletins 38–42.

Pennsylvania.— Bulletins 32–34.

Rhode Island.— Bulletins 33–41.

South Carolina.— Bulletins 21–26. Seventh and Eighth Annual Reports, for 1894 and 1895.

South Dakota.— Bulletins 45–48. Eighth Annual Report, for 1894–95.

Tennessee.— Bulletins, Vol. 8, Nos. 1–4.

Texas.— Bulletins 37–39. Seventh and Eighth Annual Reports, for 1894 and 1895.

Utah.— Bulletins 40–45. Fifth and Sixth Annual Reports, for 1894 and 1895.

Vermont.— Bulletins 49–53.

Virginia.— Bulletins 46–56, 61 and 62. (Fifth) and (Sixth) Annual Reports, for 1893–94 and 1894–95.

Washington.— Bulletins 19 and 20. Fourth and Fifth Annual Reports, for 1893–94 and 1894–95.

West Virginia.— Bulletins 40–44. Special Bulletin, September, 1896.

Wisconsin.— Bulletins 44–54. Twelfth Annual Report, for 1894–95.

Wyoming.— Bulletins 26–29.

Canada.— *Central Experimental Farm*, *Ottawa*, Bulletins 24 and 25. [Seventh, Eighth and Ninth] Annual Reports, for 1893, 1894, and 1895. Report of the Horticulturist, 1895.

Ontario Agricultural College Experiment Station, *Guelph*, Bulletins 101–103. Twenty-first Annual Report, for 1895.

Massachusetts Agricultural College. 33rd Annual Report. January, 1896. Pamph., tea, 9.1×.8×5.8, pp. 353; plates, colored and plain, cuts. Boston: 1896. H. H. Goodell, President.

Michigan State Agricultural College. Report of the Botanical Department for the year closing June 30, 1895. By W. J. Beal, M. S., Ph.D. Pamph., fawn-color, 9.1×—×6.4, pp. 51–76; 1 plan. The Author.

West Virginia Agricultural College. Descriptive Circular. Pamph., 5.3×—×4.2, pp. 31, (13); cuts.

Experimental Farm of the North Carolina State Horticultural Society, Southern Pines, N. C. First Annual Report, for 1895. Fertilizer

Tests conducted by the North Carolina State Horticultural Society in coöperation with the North Carolina Agricultural Experiment Station and the German Kali Works. Pamph., light blue, 9.2×.1×5.8, pp. 45; 24 cuts. Raleigh, N. C.: 1896. H. B. Battle, Director, Agricultural Experiment Station.

NOXIOUS PLANTS.

Beal, W. J. Points on Weeds. Pamph., 8.9×—×6., pp. 3.

Stevens, W. C., M. S., *Editor*. The Russian Thistle: its character, presence in Kansas, and suggestions for its extermination. Published by the Kansas State Board of Agriculture, month of August, 1894. Pamph., fawn-color, 8.8×—×6., pp. 15; 5 plates. Topeka: 1894. F. D. Coburn, Secretary, State Board of Agriculture.

INSECTS.

Fernald, C. H., A. M., Ph.D. The Crambidæ of North America. Pamph., blue, 9.×.2×5.8, pp. 93; plates A–C, colored plates 1–6, cuts. Massachusetts Agricultural College, January, 1896. The College.

Ormerod, Eleanor A., F. R. Met. Soc. Report of Observations of Injurious Insects and Common Farm Pests, during the year 1895, with Methods of Prevention and Remedy. Nineteenth Report. Salmon-colored paper, 9.6×.3×6.1, pp. x, 156; 2 plates, cuts. London: 1896. S. F.

Ontario Entomological Society. Twenty-sixth Annual Report. 1895. Published by the Ontario Department of Agriculture, Toronto. Pamph., terra-cotta, 9.6×.2×6.5, pp. 102; 2 portraits, cuts. Toronto: 1896. W. E. Saunders, Secretary.

Canadian Entomologist, The. Edited by the Rev. C. J. S. Bethune, and others. Vol. 28, 1896. 12 pamphs., tea, 8.9×—×5.7, pp. 319; 4 plates, cuts. London, Ont.: 1896. J. Alston Moffat, Librarian Entomological Society.

Massachusetts State Board of Agriculture. Report on the work of Extermination of the Gypsy Moth. January, 1896. Pamph., tea, 9.1×.1×5.8, pp. 44; col. frontispiece, 2 plates. Boston: 1896. Hon. William R. Sessions, Secretary, State Board of Agriculture.

Forbush, Edward H., and Charles H. Fernald, A. M., Ph.D. The Gypsy Moth. Porthetria dispar (Linn.) A Report of the Work of Destroying the Insect in the Commonwealth of Massachusetts together with an account of its history and habits both in Massachusetts and Europe. Published under the direction of the State Board of Agriculture by authority of the Legislature. Black cloth, 9.1×1.8×6., pp. xii, 495, c; colored and plain plates, cuts, maps. Boston: 1896. E. H. Forbush.

New York State Entomologist, Report of the, to the Regents of the University of the State of New York. For the year 1893. (From the Forty-seventh Report on the New York State Museum.) By J. A. Lintner, Ph.D. Pamph., fawn, 9.1×—×5.7, pp. 175–197. Albany: 1894. Prof. Lintner.

INSECTS, *continued.*

New York, Injurious and other Insects of the State of. Tenth Report, for the year 1894. [From the Forty-eighth Report on the New York State Museum.] By J. A. Lintner, Ph.D., State Entomologist. Green cloth, 9.1×.7×5.9, pp. 339–633, (1); 4 plates, cuts. Albany: 1895. Prof. Lintner.

Illinois, Noxious and Beneficial Insects of the State of, Eighteenth Report of the State Entomologist on the. (Seventh Report of S. A. Forbes.) For the years 1891 and 1892. Pamph., tea, 8.8×.5×5.8, pp. xi, 171, xiii; 15 plates. Springfield, Ill.: 1894. L. A.

PLANT DISEASES, ETC.

Atkinson, George F. Carnation Diseases. (Paper presented before the American Carnation Society at their annual meeting, Feb. 22, 1893, at Pittsburgh.) Pamph., 11.7×—×8.7, pp. (10); 33 cuts. Thomas Harrison.

Rutgers College and Rutgers Scientific School, Extension Department of the New Jersey State College for the benefit of Agriculture and the Mechanic Arts. Syllabus No. 12. Agricultural Botany. Part II. Fungous Diseases of Cultivated Plants. Six Lectures by Byron D. Halsted, Sc. D. Pamph., 7.6×—×5.4, pp. 36. New Brunswick, N. J.: 1896. Prof. Byron D. Halsted.

Victoria Department of Agriculture. Systematic Arrangement of Australian Fungi, together with Host-Index and List of Works on the subject. By D. McAlpine, Government Vegetable Pathologist. Pamph., light blue, 10.8×.7×8.6, pp. vi., (1), 236, (1). Melbourne: 1895. M. S. Dowden, Librarian, Public Library, Museums and National Gallery of Victoria.

SPRAYING.

Lodeman, E. G., Instructor in Horticulture in the Cornell University. The Spraying of Plants. A succinct account of the history, principles, and practice of the application of liquids and powders to plants for the purpose of destroying insects and fungi. With a preface by B. T. Galloway, Chief of the Division of Vegetable Pathology, United States Department of Agriculture. Dull blue cloth, 7.2×1.×5., pp. xvii, 399; 1 portrait, 92 cuts. New York and London: 1896. S. F.

Galloway, B. T., and A. F. Woods. Spraying with Fungicides as a means of Increasing the Growth and Productiveness of Plants. (Reprint from Proceedings of the American Association for the Advancement of Science, Springfield, Mass., 1895.) Pamph., 9.2×—×5.8, pp. 42–53. B. T. Galloway.

GENERAL BOTANY.

Engler, A., und K. Prantl, fortgesetzt vor A. Engler. Die natürlichen Pflanzenfamilien nebst ihren Gattungen und wichtigeren Arten

insbesondere den Nutzpflanzen, etc. Lieferungen 128–141. 12 pamphs., 10.1×.1–.3×7., plates, cuts. Leipzig: 1895–96. S. F.

Hooker's Icones Plantarum; or figures, with descriptive characters and remarks, of new and rare plants selected from the Kew Herbarium. Fourth Series. *Vol. V, Part I*, November, 1895. Edited for the Bentham Trustees by Daniel Oliver, F. R. S., F. L. S. Under the authority of the Director of the Royal Botanic Gardens, Kew. Plates 2401–2425, with descriptive text. London: 1895. *Parts II–IV*, January, May and July, 1896. Edited for the Bentham Trustees by W. T. Thiselton Dyer, C. M. G., C. I. E., M. A., B. Sc., Ph.D., F. R. S., Director Royal Gardens, Kew. Plates 2426–2500, with descriptive text. London: 1896. Half green morocco, 9.×1.8×6. S. F.

Delessert, Benj. Icones selectae plantarum quas in systemate universali, ex herbariis Parisiensibus, præsertim ex Lessertiano descripsit Augustin Pyramus De Candolle, ex archetypis speciminibus a P. J. F. Turpin delineatæ. 5 vols., dark blue cloth, pp. 26, 28, 68, 52 and 53; 100 plates in each volume. Parisiis: 1820–1846. S. F.

Snelgrove, Edward, B.A. Object Lessons in Botany from Forest, Field, Wayside and Garden. (Book II., for Standards III, IV, & V.) Being a Teacher's Aid to a systematic course of one hundred lessons for boys and girls. Green cloth, 7.5×.9×5.1, pp. xviii, 11–297; frontispiece, 153 cuts. London: (1894.) S. F.

Baillon, Henri, *and others.* Dictionnaire de Botanique. 4 vols., half dark green morocco, 12.6×1.3–2.4×8.9, pp. xii, 788; 776; 756; 340: colored plates, cuts. Paris: 1876, 1886, 1891, 1892. S. F.

Leopoldina, Botanisches Beiblatt zur. 1895.

Compositæ novæ Costaricenses. Auctore Dr. F. W. Klatt. pp. 8.

Neue afrikanische Compositen. Auctore Dr. F. W. Klatt. pp. 2.

Zur Mechanik der Spaltöffnungsbewegung. Von Professor Dr. F. G. Kohl in Marburg. pp. 4.

3 pamphs., 12.7×—×9.8. Prof. Dr. K. v. Fritsch.

ECONOMIC BOTANY.

Wissett, Robert, F. R. and A. S. A Treatise on Hemp, including a comprehensive account of the best modes of Cultivation and Preparation as practised in Europe, Asia, and America; with observations on the Sunn Plant of India, which may be introduced as a substitute for many of the purposes to which hemp is now exclusively applied. With an Appendix on the most effectual means of producing a sufficiency of English grown Hemp. Half maroon morocco, 11.5×1.×9.3, pp. xvi., 296; 5 plates. London: 1808. S. F.

Forbes, G. S. Reports on the Fibres of Southern India. Selections from the Records of the Madras Government. Blue-green cloth, 9.8×.9×6.4, pp. 167. Madras: 1856. S. F.

ECONOMIC BOTANY, *continued.*

Hector, James, M.D., F. R. S., *Editor*. Phormium tenax as a Fibrous Plant. Being selections from the reports of the Commissioners appointed by the New Zealand Government, 1870–1872. (Colonial Museum and Geological Survey Department.) Dark blue cloth, 9.4×.6×6., pp. v, (3), 134. Wellington, New Zealand: 1872. S. F.

Henney, Thomas. Prize Essay on the Cultivation of the Sugar Cane. (Reprinted from the Supplement to the Jamaica Times. Kingston, Saturday, Nov. 18, 1843.) Pamph., blue, 8.9×—×5.8, pp. 12. L. A.

Cooke, Dr. M. C. Report on the Oil Seeds and Oils in the India Museum, or produced in India. Prepared under the direction of the Reporter on the Products of India. (By J. Forbes Watson). Tea paper, 13.×.2×8.3, pp. 85; 41 cuts. London: 1876. S. F.

MEDICAL BOTANY.

Strong, A. B., M.D. The American Flora, or History of Plants and Wild Flowers: containing their scientific and general description, natural history, chemical and medical properties, mode of culture, propation, etc., designed as a book of reference for botanists, physicians, florists, gardeners, students, etc. 4 vols, half black morocco, 9 8×1.2×7.5, pp. 190, 192, 184, and 184; colored plates 52, 47, 45, and 45. New York: 1849–1851. S. F.

Luerssen, Dr. Chr. Medicinisch-Pharmaceutische Botanik, zugleich als Handbuch der systematischen Botanik für Botaniker, Arzte und Apotheker. 2 vols. Vol. I. Kryptogamen. pp. xii, 657; 181 cuts. Leipzig: 1879. Vol. II. Phanerogamen. pp. x, ii, 1229; 231 cuts. Leipzig: 1882. Half red morocco, 9.4×1.7–3.×6.6. Dr. W. P. Bolles.

Guibourt, N. J. B. G. Histoire naturelle des Drogues simples, ou Cours d'Histoire naturelle. Septième édition corrigée et augmentée par G. Planchon. Précédée de l'Éloge de Guibourt par H. Buignet. 4 vols. bound in 2. Half green morocco, 8.5×2.5×5.8, pp. xxxviii, 584; 608; 778; 463: 1077 cuts. Paris: 1876. Dr. W. P. Bolles.

TERRITORIAL BOTANY.

Britton, Nathaniel Lord, Ph.D., and Hon. Addison Brown. An Illustrated Flora of the Northern United States, Canada, and the British Possessions; from Newfoundland to the Parallel of the southern Boundary of Virginia, and from the Atlantic Ocean westward to the 102d meridian. The descriptive text chiefly prepared by Professor Britton, with the assistance of specialists in several groups; the figures also drawn under his supervision. In three volumes. Vol. I. Ophioglossaceae to Aizoaceae. Ferns to Carpet-weed. Olive-green

cloth, 11.1×1.5×7.7, pp. xii, 612; 1425 cuts. New York: 1896. S. F.

Minnesota Botanical Studies. Edited by Conway MacMillan, State Botanist. Parts I, III, VIII, and IX. Jan. 16 and June 9, 1894, and April 30 and Nov. 30, 1896. (Geological and Natural History Survey of Minnesota, Bulletin 9. [Botanical Series II.]) 4 pamphs., blue, 9.7×.1–.3×6.4, pp. 38; 87–175; 483–600; 601–701: plates 3; 28–30; 31–39. Minneapolis, Minn.: 1894 and 1896. Conway MacMillan, State Botanist, and Miss C. M. Endicott (Part III).

Browne, Patrick, M. D. The Civil and Natural History of Jamaica. Full calf, 16.5×2.×10.3, pp. viii, 503, (2); 50 plates, map. London: 1756. John G. Barker.

Baillon, H. Iconographie de la Flore Française. 5 vols., olive-green cloth, 7.6×1.1×5., 100 colored plates in each volume, and descriptive text. Paris: n. d. S. F.

Buc'hoz, Pierre Joseph. Traité historique des plantes qui croissent dans la Lorraine et les trois Evêchés. 10 vols. (bound in 5), half calf, 6.4×1.–1.5×4.2. Paris: 1770. S. F.

Reichenbach, L., et H. G. Reichenbach, fil. Icones Florae Germaniae et Helveticae simul terrarum adjacentium ergo mediae Europae. Tom. 23. Decas 1. Green paper, 12.6×.1×6.7., pp. 8; 10 colored plates. Lipsiae: n. d. (1896). S. F.

Candolle, Augustin Pyramus de. Histoire de la Botanique Genevoise. Discours prononcé a la Cérémonie Académique des Promotions, le 14 juin 1830. (Mem. de la soc. de physique et d'hist. nat. de Genève, Vol. V, part 1.) Pamph., blue, 10.1×.2×8.2, pp. 61. Genève et Paris: 1830.

Parlatore, Filippo, continuata da Teodoro Caruel. Flora Italiana. Indice generale dei dieci volumi della Flora Italiana. Blue paper, 9.2×—×6.1, pp. 31. Firenze: Aprile, 1896. S. F.

Cesati, V., G. Passerini e G. Gibelli. Compendio della Flora Italiana. Fasc. 40, (in continuation). Pink paper, 10.7×.1×7.7, plates 124–129, with descriptive text. Milano, Napoli, etc.: n. d. S. F.

Kops, Jan, voortgezet door F. W. Van Eeden. Flora Batava. Afbeelding en Beschrijving van Nederlandsche Gewassen. Etc. (Vol. 20), parts 311–314. Unbound, 10.×—×6.7, colored plates 1556–1575, with descriptive text. Leiden: (1895?) and Haarlem: 1896. S. F.

Barnard, Rev. M. R., B. A. Sport in Norway and where to find it. Together with a short account of the Vegetable Productions of the country. To which is added a list of the Alpine Flora of the Dovre Fjeld and of the Norwegian Ferns, etc. Red cloth, 8.1×1.3×5.2, pp. xvi, 334; frontispiece, 1 plate, cuts. London: 1864. S. F.

Battandier, J. -A., et —— Trabut. Flore de l'Algérie contenant la description de toutes les plantes signalées jusqu'a ce jour comme spontanées en Algérie, et catalogue des plantes du Maroc. 2 vols. bound in one. Green cloth, 9.7×2.5×6.6, pp. xi, 825, iii, xxix, and 256; 7 plates. Alger et Paris: 1888–90 and 1895. S. F.

TERRITORIAL BOTANY, *continued.*

Tchihatchef, P. de. Espagne, Algérie et Tunisie. Lettres a Michel Chevalier. Maroon cloth, 11.×1.8×7.4 pp. xx, 595; 1 map. Paris, Alger, Madrid: 1880. S. F.

———, — —. Asie Mineure. Description physique de cette contrée. Troisième partie. Botanique. 2 vols. and Atlas, maroon cloth, 11.×1.3×7., and 14.×.9×11. (1.) pp. lvi, (4.), 484; (2.) pp. xvi, 676; (atlas) 44 plates. Paris: 1866. S. F.

Trimen, Henry, M. B. (Lond.), F. R. S. A Hand-Book to the Flora of Ceylon containing descriptions of all the species of flowering plants indigenous to the island, and notes on their history, distribution and uses. *Part I.* Ranunculaceæ—Anacardiaceæ (with plates I–XXV), pp. xvi, 327. London: 1893. *Part II.* Connaraceæ—Rubiaceæ (with plates XXVI—L, and Index to parts I and II), pp. (3), 392. London: 1894. *Part III.* Valerianaceæ—Balanophoraceæ (with plates LI—LXXV.) pp. 477, (1). London: 1895. 3 vols. text, olive-brown cloth, 8.8×1.6×6., and atlas, boards, green cloth back, 12.8×1.×11. London: 1893–1895. S. F.

PHYSIOLOGICAL BOTANY.

Sorauer, Dr. Paul. A Popular Treatise on the Physiology of Plants for the use of gardeners or for students of horticulture and of agriculture. Translated by F. E. Weiss, B. Sc., F. L. S. Dark olive-green cloth, 9.×1.1×5.8, pp. x, 256; 33 cuts. London and New York: 1895. S. F.

Henslow, Rev. George, M. A., F. L. S., F. G. S., etc. The Origin of Plant Structures by self-adaptation to the environment. (The International Scientific Series. Vol. LXXVII.) Red cloth, 7.6× 1.1×5.2, pp. xiii, 256. London: 1895. S. F.

Allen, C. L. Plant Variation. Read before the American Seed Trade Association, June 11, 1896. Pamph., 9.2×—×5.8, pp. 14. (New York: 1896.) The Author.

Die Litteratur des Jahres 1892 über Morphologie, Systematik und Verbreitung der Phanerogamen nebst Register. (Sonderabdruck aus "Just's Botanischem Jahresbericht.") Green paper, 10.×.9× 6.2, pp. 209, 268–382, 417–621. Berlin: 1895. Gebrüder Borntræger, *Publishers.*

Moeller, Dr. Joseph. Anatomie der Baumrinden. Half black cloth, 9.6× 1.×6.7, pp. viii, 447; 146 cuts. Berlin: 1882. Dr. W. P. Bolles.

Eichler, Dr. A. W. Blüthendiagramme. Erster Theil, enthaltend einleitung Gymnospermen, Monocotylen und Sympetale Dicotylen. Zweiter Theil, enthaltend die Apetalen und Choripetalen Dicotylen. 2 vols. in 1, half brown morocco, 9.5×1.7×6.6, pp. viii, 347; xx, 575: cuts 176 and 237. Leipzig: 1875, 1878. Dr. W. P. Bolles.

Bary, A. de. Vergleichende Morphologie und Biologie der Pilze, Mycetozoen und Bacterien. Half dark red morocco, 9.4×1.2×6.4, pp. xvi, 558; 198 cuts. Leipzig: 1884. Dr. W. P. Bolles.

CRYPTOGAMIC BOTANY.

Massee, G. The Evolution of Plant Life: Lower Forms. (University Extension Series.) Blue cloth, 7.3×1.×5., pp. viii, 242; 38 cuts. London: 1891. S. F.

Waters, C. E. An Analytical Key for our Local Ferns, based on the Stipes. (Reprinted from the Johns Hopkins University Circulars, No. 119, June, 1895.) Pamph., 8.9×—×5.7, pp. (4). George E. Davenport.

Mettenius, G. Filices Lechlerianae, chilenses ac peruanae, cura R. F. Hohenackeri editae. Fasciculi duo. Boards, marbled green, 8.1× .3×5.5, pp. 30, 38; 3 plates. Lipsiae: 1856, 1859. S. F.

Smith, John, A. L. S. Ferns: British and Foreign. The History, Organography, Classification and Enumeration of the species of garden ferns. With a treatise on their cultivation, etc., etc. New and enlarged edition. Green cloth, 7.5×1.4×5.3, pp. xv, 450; 1 plate, cuts. London: 1879. S. F.

Prantl, K. Beiträge zur Systematik der Ophioglosseen. (Jahrbuch des botanischen Gartens. III.) Paper, green back, 9.4×.1×6.1, pp. 297–350; 2 plates (VII and VIII.) S. F.

Linnaean Fern Bulletin, The. Published by the Linnaean Fern Chapter (of the Agassiz Association). Vols. 1–4 (bound in one), 1893–1896. Green cloth, 6.4×.6×4.8. Binghamton, N. Y.: 1893–1896. L. A. [Nos. 3 and 12 from George E. Davenport].

Correvon, H. Les Fougères de pleine terre et les Prêles, Lycopodes, et Sélaginelles rustiques. (Bibliothèque d'Horticulture et de Jardinage.) Tan-colored cloth, 7.×.5×4.6, pp. v, 144; 68 cuts. Paris: 1896. S. F.

Eaton, Daniel C. A Check-List of North American Sphagna. Arranged mostly in accordance with the writings of Dr. Carl Warnstorf. Pamph., 8.3×—×5.4, pp. 10. New Haven, Conn.: May, 1893. Edwin Faxon.

Eaton, D. C., et E. Faxon. Sphagna Boreali-Americana exsiccata. Distribuit G. F. Eaton. Pamph., pale green, 9.1×—×5.8, pp. 14. New Haven, Conn.: 1896. Edwin Faxon.

Collins, Frank Shipley, Isaac Holden and William Albert Setchell, assisted by others. Phycotheca Boreali-Americana. A collection of dried specimens of the Algæ of North America. Fascicles IV and V. 2 vols., half maroon morocco, 13.2×1.2×9.7, 50 species in each fascicle. Malden, Mass.: March and September, 1896. S. F.

Cooke, M. C., M. A., LL.D., A. L. S. Introduction to the Study of Fungi, their organography, classification, and distribution, for the use of collectors. Light green linen, 9.3×1.8×6.3, pp. x, 360; 148 cuts. London: 1895. S. F.

Peck, Charles H., New York State Botanist. Boleti of the United States. (Bulletin No. 8 of the New York State Museum, September, 1889.) Pamph., drab, 9.8×.2×6.8, pp. 73–166. Albany: 1889. L. A.

CRYPTOGAMIC BOTANY, *continued.*

Lucand, (Capitaine). Figures peintes de Champignons de la France. (Suites a l'Iconographie de Bulliard.) 17e fascicule. Blue-gray paper, 13.1×.2×10., colored plates 401–425. Autun: 1889. S. F.

Stevenson, Rev. John. Hymenomycetes Britannici. British Fungi (Hymenomycetes). 2 vols., green cloth, 8.×1.4×5.5, pp. vii, 372; 336: 103 cuts. Edinburgh and London: 1886. S. F.

BOTANICAL MONOGRAPHS.

Marquess of Lothian. The Genus Masdevallia. Issued by the Marquess of Lothian, K. T., chiefly from plants in his collection of Orchids at Newbattle Abbey; plates and descriptions by Miss Florence H. Woolward; with engravings from photographs. Additional Notes by Consul F. C. Lehmann. (German Consul in the republic of Colombia). *Part VIII.* 10 colored plates, with descriptive text. *Part IX.* [Completing the work.] pp. (10, 38); 7 colored plates, with descriptive text, 1 map. Half maroon morocco, 18.3×2.1×13.4. London: 1896. S. F.

Camus, E. G. Monographie des Orchidées de France. (Extrait du Journal de Botanique.) Half light brown morocco, 9.6×1.6×7., pp. 130; 51 photographic plates, partly colored, (numbered 1–50), and 1 unnumbered plate. Paris: n.d. S. F.

Fitzgerald, R. D., F. L. S. Australian Orchids. Vol. 2, part 5. With preface to the present part by the Hon. Dr. Norton, M.L.C., F.L.S. Green paper, mottled-brown cloth back, 19.9×.3×13.3, 11 colored plates, with descriptive text. Sydney, N. S. W.: n.d. (1896.) S.F.

Duval, Léon. Les Broméliacées. Histoire, multiplication, culture et liste des plus jolies espèces pouvant être cultivées ou employées a la décoration des serres et des appartements. (Bibliothèque d'Horticulture et de Jardinage.) Tan-colored cloth, 7.1×.5×4.7, pp. (5), v, 150; 46 cuts. Paris: 1896. S. F.

Smith, Jared G. North American Species of Sagittaria and Lophotocarpus. (Printed in advance from the Sixth Annual Report of the Missouri Botanical Garden.) Issued May 24, 1894. Pamph., light brown, 9.×.3×6., pp. 38; 29 plates. William Trelease, Director Missouri Botanical Garden.

BOTANICAL JOURNALS.

Balfour, Isaac Bayley, Sydney Howard Vines, D. H. Scott, and William Gilson Farlow, *Editors*, assisted by other Botanists. Annals of Botany. Vol. IX., Nos. XXXIII, XXXIV, XXXV and XXXVI. March, June, September, and December, 1895. Half calf, 9.5×2.6×7.3. pp. 668 and title-page and contents (pp. viii); 25 plates. London and Oxford: 1895. L. A.

BOTANICAL SOCIETIES.

Torrey Botanical Club. Bulletin. Edited by Nathaniel Lord Britton and other members of the Club. Vol. 23, 1896. Half green morocco, 9.1×2.×6.5, pp. xii, 548; plates 253–286. New York: 1896. The Club.

—— —— ——. Memoirs. *Vol. IV, No. 5.* The North American Species of Physalis and related genera. By Per Axel Rydberg. Issued September 15, 1896. pp. 297–374.

Vol. VI, No. 1. An Enumeration of the Plants collected in Bolivia by Miguel Bang, with descriptions of new genera and species. Part 3. By Henry H. Rusby. Issued November 17, 1896. pp. 130. 2 parts, fawn-colored paper, 9.1×.3×5.9. S. F.

Botanical Society of America. Botanical Opportunity. Address of the retiring president, William Trelease, Sc.D., Director of the Missouri Botanical Garden, delivered before the Botanical Society of America at its Second Annual Meeting, Buffalo, N. Y., Aug. 21, 1896. (From the Botanical Gazette, Vol. XXII.) Pamph., olive, 9.4×—×6.7, pp. 24. William Trelease.

Linnean Society of London. Transactions. 2nd. Ser. Botany. *Vol. IV, Part 3.* The Phanerogamic Botany of the Matto Grosso Expedition, 1891–92. By Spencer Le Marchant Moore, B. Sc., F. L. S., Botanist to the Expedition. Read 2nd November, 1893. pp. 265–516, plates 21–39, map. London: December, 1895. *Part 4.* Title-page, contents and index. pp. 517–542. London: March, 1896.

Vol. V, Part 3. Observations on the Loranthaceæ of Ceylon. By F. W. Keeble, B. A. (Communicated by Francis Darwin, F. R. S., F. L. S.) Read 18th April, 1895. pp. 91–117; plates 10 and 11. London: May, 1896. *Part 4.* The Distribution of plants on the South side of the Alps. By the late John Ball, F. R. S., F. L. S., with an Introductory Note, by W. T. Thiselton Dyer, C. M. G., C. I. E., F. R. S., F. L. S. Read 2nd May, 1895. pp. 119–227. London: July, 1896.

4 parts, blue paper, 11.9×.1–.7×9.2. S. F.

—— ——. Journal. Botany. *Vol. XXX, No. 211*, Sept. 7, 1895. pp. 435–561; plates 35–37, cuts. London: 1895.

Vol. XXXI, Nos. 212–227, Nov. 4, 1895–July 8, 1896. pp. 1–461; 15 plates, cuts.

6 parts, blue paper, 8.7×.3×5.6. London: 1895 and 1896. S. F.

Linnean Society of London, List of the. 1895–96. Blue paper, 8.5×.1×5.6, pp. 51. London: 1895. S. F.

BOTANICAL GARDENS.

Macdougal, D. T. Botanic Gardens. (*From* Appleton's Popular Science Monthly, Vol. L, No. 2, Dec. 1896.) pp. 172–186; cuts. J. D. W. French.

BOTANICAL GARDENS, *continued.*

New York Botanical Garden. Bulletin. Vol. I, No. 1, Apr. 15, 1896. Pamph., flesh-color, 9.×.1×5.9, pp. 21; 1 map. N. L. Britton, Secretary.

Missouri Botanical Garden. Seventh Annual Report [for the year 1895]. Contents.—1. Reports for the year 1895 :— *a.* Report of the officers of the Board. *b.* Seventh Annual Report of the Director. 2. Scientific Papers : — *a.* Juglandaceæ of the United States. By William Trelease. *b.* A study of the Agaves of the United States. By A. Isabel Mulford. *c.* The Ligulate Wolffias of the United States. By Charles Henry Thompson. 3. Anniversary Publications :— *a.* The value of a Study of Botany. By Henry Wade Rogers. 4. Library Contributions : — *a.* The Sturtevant Prelinnean Library. Olive-green cloth, 9.7×1.2×6.7, pp. 209; frontispiece, plates, (4), 66, (1). St. Louis, Mo : 1896. William Trelease, Director.

——— ——— ———, The Sturtevant Prelinnean Library of the. (Reprinted from the Seventh Annual Report of the Missouri Botanical Garden.) Pamph., light blue, 8.9×.3×6, pp. 123–209. St. Louis : 1896. William Trelease, Director. [2nd copy from Dr. E. Lewis Sturtevant.]

Jamaica Botanical Department. Bulletin. Edited by William Fawcett, B. Sc., F. L. S., Director of Public Gardens and Plantations. New Series. Vol. III, Parts 1–12 and Appendix. January to December, 1896. 13 pamphs., 9.7×.1×6.2, pp. 315, iv, 16. Kingston, Jamaica : 1896. The Director.

British Guiana. Report on the Botanic Gardens and their work for the year 1886. By G. S. Jenman, Govt. Botanist and Supt. Botanic Gardens. Blue paper, 13.1×.1×8.2, pp. 36. Georgetown, Demerara : 1887. S. F.

Kew, Royal Gardens. Bulletin of Miscellaneous Information, 1895. Boards, green cloth back, 9.4×.9×5.9, pp. ii, 334, 63; 3 plates, cuts. London : 1895. W. T. Thiselton Dyer, Director.

——— —— ——. Hand-List of Trees and Shrubs grown in Arboretum. Part I. Polypetalæ. Pamph., tea, 7.2×.4×4.8, pp. 297. London : 1894. L. A.

——— —— ——. Hand-List of Herbaceous Plants cultivated in the Royal Gardens. Pamph., tea, 7.2×.8×4.7, pp. 495. London : 1895. L. A.

——— —— ——. Hand-List of Ferns and Fern Allies cultivated in the Royal Gardens. Pamph., tea, 7.2×.3×4.8, pp. 183. London : 1895. L. A.

——— —— ——. Hand-List of Orchids cultivated in the Royal Gardens. Pamph., tea, 7.2×.4×4.8, pp. 225. London : 1896. L. A.

——— —— ——. Hand-List of Coniferæ grown in the Royal Gardens. Pamph., tea, 7.3×.2×4.8., pp. 114. London : 1896. L. A.

——— ——— ———. Key-Plan and Index to the Royal Botanic Garden and Arboretum, Kew. Revised edition, 1893. Broadside, 16.×11.9. L. A. [2nd copy.]

——— ——— ———. Official Guide to the Museums of Economic Botany. *No. I.* Dicotyledons and Gymnosperms. Second Edition, revised and augmented. pp. 173. London: 1886. *No. 2.* Monocotyledons and Cryptogams. pp. 109. London: 1895. *No. 3.* Timbers. Second Edition, revised and augmented. pp. 98. London: 1893. [Also] Official Guide to the North Gallery. Fifth Edition, revised and augmented. pp. xxxvi, 161; 1 map. London: 1892. Green cloth, 7.×1.×5. L. A.

Kew Guild, an Association of Kew Gardeners, past and present, The Journal of the. May, 1896. Pamph., green, 9.7×.1×6.2, pp. 50; portraits. London: 1896. W. Watson.

(**Underwood**, John.) Catalogue of Plants in the Arboretum, Fruticetum, Herbarium, Gramina vera, Hortus Tinctorius, Hot and Green houses of the Dublin Society's Botanic Garden, at Glasnevin. Boards, brown cloth back, 9.×1.1×5.5, pp, 247; 1 plan. Dublin: 1802. S. F.

Candolle, Augustin Pyramus et Alphonse de. Notices sur les plantes rares cultivées dans le Jardin botanique de Genève. Nr. 1, 2, 6, 8, 9. (Extraits des Mémoires de la Soc. Phys. et d'hist. nat. de Genève.) 5 pamphs., blue, green, etc., 10.–11.2×.1×8.8, pp. 33, 23, 24, 31, and 20; plates. Genève: 1823–1845. L. A.

Acta Horti Petropolitani. *Tomus XIV, fasc. I.* pp. 184; 11 plates. *Tomus XV, fasc. I.* pp. 160; 1 plate, 4 maps. 2 pamphs., gray, 9.9.×.3×6.7. St. Petersburg: 1895 and 1896. A. Batalin, Director of the Botanic Garden, St. Petersburg.

Buitenzorg, Annales du Jardin botanique de. Publiées par M. le Dr. Melchior Treub. *Vol. XIII, part 2.* pp. 137–326, (1); plates 16–30, colored and plain. *Vol. XIV, part 1.* pp. 240; 17 plates. 2 parts, blue paper, 10.×.8×6.9. Leide: 1896. S. F.

Schomburgk, Richard, Dr. Phil., *Director.* Catalogue of the Plants under cultivation in the Government Botanic Garden, Adelaide, South Australia. Boards, cream-color, faded maroon cloth back, 8.2×1.×5.4, pp. xix, (4), 285; frontispiece, plates. Adelaide: 1878. S. F.

NATURAL HISTORY SOCIETIES, ETC.

Boston Society of Natural History. Memoirs. *Vol. V, No. 1.* On the Reserve Cellulose of the Seeds of Liliaceae and of some related orders. By Grace E. Cooley. pp. 29; 6 plates. Boston: July, 1895. *No. II.* pp. 31–52; plates 7–10. Boston: October, 1895. 2 pamphs., tea, 12.×.1×9.6. The Society.

——— ——— — ——— ———. Proceedings. *Vol. XXVI, part 4.* pp. v, 393–562; plate, cut, maps. Boston: 1895. *Vol. XXVII, Nos. 1–11.* pp. 199; plates. Pamphs., tea, 9.8×.1×6. Boston: 1896. The Society.

NATURAL HISTORY SOCIETIES, ETC., *continued.*

Essex Institute. Bulletin. *Vol. 26, Nos. 7–12*, July — December, 1894. pp. 141–202. Salem: 1894. *Vol. 27, Nos. 1–6*, January — June, 1895. pp. 52. Salem: 1895. 2 pamphs., 9.6×.3×6.1. The Institute.

Elisha Mitchell Scientific Society. Journal. *Vol. XII, Part first*, January — July, 1895. pp. 41. *Part second*, July — December, 1895. pp. 55; plates, maps, 1 cut. 2 pamphs., 8.6–9.3×.1×5.7. Chapel Hill, N. C.: 1895. F. P Venable, Secretary.

Oberlin College. Laboratory Bulletin *No. 1. Supplement.* Additions to the Preliminary List of the Flowering and Fern Plants of Lorain County, Ohio. Compiled by Albert A. Wright. pp. 11; 1 map. Oberlin: 1893. *No 3.* Bird Migration at Grinnell, Iowa, and Oberlin, Ohio. (Reprinted from "The Auk," Vol. XII, April and July, 1895.) pp. 117–244. 2 pamphs., 9.1×.1×5.9. Azariah S. Root, Librarian.

Field Columbian Museum. Publication 9. *Botanical Series. Vol I, No. 2.* Flora of West Virginia, by Charles Frederick Millspaugh, Curator, Department of Botany, and Lawrence William Nuttall. Pamph., gray, 9.8×.5×6.3, pp. (3), 69–276; frontispiece, 1 plate, 1 map, (Botany Plates V–VII). Chicago: Jan. 1896.

Publication 14. Report Series. Vol. 1, No. 2. Annual Report of the Director to the Board of Trustees, for the year 1895–96 Pamph., gray, 9.8×.2×6.4, pp. 83–166. Chicago: 1896.

F. J. V. Skiff, Director.

Chicago Academy of Sciences. Thirty-eighth Annual Report for the year 1895. Pamph., 9.× — ×6., pp. 16. Chicago: 1896.

Bulletin. *Vol. I, Nos. I–X.* (No V. — A Paper on the Northern Pitcher-Plant or the Side-saddle Flower, *Sarracenia purpurea*, L. By W. K. Higley.) 10 pamphs., tea, gray, etc., 9.8×—×6. Chicago: 1883–1886. *Vol. II, No. I.* The Flora of Cook County, Illinois, and a part of Lake County, Indiana. By W. K. Higley and Charles S. Raddin. Brown cloth, flexible covers, 8.9×.5×5.8, pp. xxiii, 168; 1 map. Chicago: 1891.

—— —— — ——. The Lichen-Flora of Chicago and vicinity. By William Wirt Calkins. (Bulletin No. 1, of the Geological and Natural History Survey.) Issued April, 1896. Pamph., gray, 9.7×.1×6.4, pp. 50; (1).

—— —— — ——. The Paramidophenol and Amidol Developers. Pamph., blue, 9.7× — ×6.8, pp (3).

Frank C. Baker, Secretary and Curator.

Iowa State University, Bulletin from the Laboratories of Natural History of the. *Vol. III, No. 4.* I. Notes on the Aquatic Phenogams of Iowa. . . . III. County Parks. IV. Notes on the Cretaceous Flora of Western Iowa. . . . VI. Nicaraguan Hymenomycetes. VII. Notes on the Flora of Iowa. VIII. An interesting Puff-Ball. pp. 135–217;

2 plates. Iowa City: February, 1896. *Vol. IV, No. 1.* . . . . iv. The Saprophytic Fungi of Eastern Iowa: The Puff-Balls. v. New Species of Tropical Fungi. vi. The Nicaraguan Myxomycetes, with notes on certain Mexican species. . . . pp. 95; 5 plates. Iowa City: December, 1896. The University.

St. Louis Academy of Science. Transactions. Vol. VII, Nos. 4–9. 6 pamphs., gray, 9.6× — ×6.3, pp. 133–228; 3 plates. (St. Louis): Dec. 20, 1895 — June 30, 1896. The Academy.

Kansas Academy of Science. Transactions of the 26th and 27th Annual Meetings. 1893–1894. Vol. XIV. Maroon cloth, 9.2×1.×6.4, pp. 370; plates, cuts, map. Topeka, 1896. B. B. Smyth, Librarian.

Hay, Robert, F. G. S. A. Geology and Mineral Resources of Kansas. (From the Eighth Biennial Report of the State Board of Agriculture, 1891–'92.) World's Fair Edition. Pamph., tea, 9.×.2×5.9, pp. 66; plate, map, cuts. Topeka: 1893. F. D. Coburn, Secretary, Kansas State Board of Agriculture.

Colorado College Studies. Vol VI. Papers read before the Colorado College Scientific Society. Pamph., drab, 9.1×.1×6., pp. 54. Colorado Springs, Colo.: March, 1896. The Colorado College Scientific Society.

Sierra Club Publications. *Nos. 1–11.* Pamphs., buff, 7.6.–9.8×.1–.3× 5.1–6.2. San Francisco: 1892–96. [Containing occasional articles on Western Botany.] *No. 12.* Map of the Central Portion of the Sierra Nevada Mountains and of the Yosemite Valley. May, 1896. Tan-colored cloth, 8.4×—×4.8. San Francisco: 1896. The Sierra Club.

Ottawa Naturalist. Published by the Ottawa Field Naturalists' Club. *Vol. IX, Nos. 10–12,* January–March, 1896. pp. 193–262, v. *Vol. X, Nos. 1–8.* April–November, 1896. pp. 164. 11 pamphs., blue, 8.5×—×5.6. Ottawa: 1896. S. B. Sinclair, Librarian.

Manitoba Historical and Scientific Society. Annual Reports for the years 1894 and 1895. 2 pamphs., blue, 8.3×—×5.8, pp. 22 and 32. Winnipeg: 1895 and 1896. The Society.

——— —— — —— ——. Worthies of Old Red River, by George Bryce, LL.D. Transaction No. 48. February 11, 1896. Pamph., buff, 8.5×—×5.8, pp. 12; cuts. Winnipeg: 1896. The Society.

Leopoldina. Amtliches Organ der Kaiserlichen Leopoldino-Carolinischen Deutschen Akademie der Naturforscher. Herausgegeben unter Mitwirkung der Sektionsvorstaende von dem Praesidenten Dr. C. H. Knoblauch. *Neunundzwanzigstes Heft.*—Jahrgang 1893. pp. (2), 212. Halle: 1893. *Dreissigstes Heft.*—Jahrgang 1894. pp. (2), 212. Halle: 1894. *Einunddreissigstes Heft.* Jahrgang 1895. . . . von den Praesidenten Dr. C. H. Knoblauch und Dr. K. von Fritsch. pp. (2), 224. Halle: 1895. 3 pamphs., blue, 12.4×.3×9.7. Prof. Dr. K. v. Fritsch.

Wilson Ornithological Chapter of the Agassiz Association. Bulletins 7 and 8. 2 pamphs., tea, 7.7×—×5., pp. 12, 12. Oberlin, Ohio: 1896. A. S. Root, Librarian, Oberlin College Library.

MISCELLANEOUS.

Nature. A Weekly Illustrated Journal of Science. Vols. 48–52 1893–1895. Unbound, 11.×2.2×8., cuts. London: 1893–1895. L. A. [To fill up set.]

Smithsonian Institution. Eighth Annual Report of the Board of Regents. Showing the operations, expenditures, and condition of the Institution up to January 1, 1854. Black cloth, 9.3×.9×5.9, pp. 269. Washington: 1854. The Family of Hon. Marshall P. Wilder.

United States Consular Reports. Nos. 20, 24½, 27, 28, 29, and 183–194. June and October, 1882, January, February, and March, 1883, and December, 1895 — November 1896. 17 pamphs., blue, 8.9×.3–.6×5.7. Washington: 1882, 1883, 1895, 1896. Hon. Richard Olney, Secretary of State.

United States Special Consular Reports. Vol. XI. American Lumber in Foreign Markets. pp. 217, viii. Washington: 1894.

Vol. XII, Highways of Commerce. The Ocean Lines, Railways, Canals, and other Trade Routes of Foreign Countries. pp. 763; maps. Washington: 1895.

Vol. XIII, part I. Money and Prices in Foreign Countries, being a series of reports upon the currency systems of various nations in their relation to prices of commodities and wages of labor. pp. 274. Washington: 1896.

3 pamphs., terra-cotta, 8.9×.2–.6×5.7. Hon. Richard Olney, Secretary of State.

United States Bureau of Education. Report of the Commissioner of Education. 1892–93. In two volumes. pp. ix, 1224 and v, 1225–2153. Washington: 1895.

1893–94. In two volumes. pp. xlvii, 1061 and 1063–2290. Washington: 1896.

1894–95, Vol. I. pp. lvii, 1152. Washington: 1896.

5 vols., black cloth. W. T. Harris, Commissioner.

Harley, Lewis R. A History of the Public Education Association of Philadelphia. Philadelphia: 1896. Prof. Edmund J. James.

Boston Asylum and Farm School for Indigent Boys, Thompson's Island. Report of the Board of Managers, 1896. Boston: 1896. C. H. Bradley, Superintendent.

Massachusetts Institute of Technology. The Course in Mining Engineering and Metallurgy. Boston: 1896. The Institute.

Yale University. Catalogue. CXCVI year. 1895–96. New Haven: 1895. The University.

——— ———. Report of the President. 1895. The University.

Illinois, University of. Catalogue. 1895–96. Urbana: (1896). The University.

Boston Public Library. Annual Report of the Trustees. 1895. Boston: 1896. The Trustees.

——— —— ——. Rules and Regulations. Revised to March, 1896. The Trustees.

Bowdoin College Library. Bibliographical Contributions. No. 5. The College.

Lancaster, Mass., Town Library. 33d Annual Report of the Trustees. 1895-96. Ella S. Wood, Librarian.

Lawrence Free Public Library. 24th Annual Report for 1895. Lawrence, Mass.: 1896. The Trustees.

Salem Public Library. Seventh Report of the Trustees. December, 1895. Salem: 1896. The Trustees.

Philadelphia Library Company. Bulletin. September, 1896. New Series. No. 37. Philadelphia: 1896. The Philadelphia Library Company.

Newberry Library. Report of the Trustees for 1895. Springfield, Ill.: 1896. The Trustees.

San Francisco Free Public Library. Reports of the Board of Trustees, 1894–95, and 1895–96. San Francisco: 1895, 1896. The Librarian.

New England Historic Genealogical Society. Proceedings at the Annual Meeting, 1 Jan., 1896. Boston: 1896. The Secretary.

Wisconsin State Historical Society. 43d Annual Meeting, Dec. 12, 1895. Reuben G. Thwaites, Secretary.

American Congregational Association. Forty-third Annual Report of the Directors. Boston: 1896. The Association.

PERIODICALS PURCHASED.

English. — Gardeners' Chronicle.
Gardeners' Magazine.
Journal of Horticulture and Cottage Gardener.
The Garden.
Gardening Illustrated.
Gardening World.
Orchid Review.
Curtis's Botanical Magazine.
Journal of Botany.
Nature.

French. — Revue Horticole.
Lyon Horticole.
Revue des Eaux et Forêts.
Répertoire de Législation et de Jurisprudence forestières.
Journal des Roses.

Belgian. — Illustration Horticole.
Revue de l'Horticulture Belge et Étrangère.
Journal des Orchidées.

German. — Botanische Zeitung.

PERIODICALS PURCHASED, *continued.*

AMERICAN.—Country Gentleman.
Garden and Forest.
Meehan's Monthly.
American Naturalist.
American Journal of Science.

PERIODICALS RECEIVED IN EXCHANGE.

Canadian Horticulturist.
Gardening.
American Gardening.
Amateur Gardening.
National Nurseryman.
Weiner Illustrirte Garten-Zeitung.
Vick's Illustrated Monthly Magazine.
The Mayflower.
Success with Flowers.
Southern Florist and Gardener.
California Garden.
American Florist.
Florists' Exchange.
Boston Flower Market.
Baltimore Cactus Journal.
Sharon Cactus Guide.
Green's Fruit Grower.
Strawberry Culturist.
Grape Belt.
Montana Fruit Grower.
Gardens and Gardening.
Botanical Gazette.
Erythea.
Pittonia.
West American Scientist.
Maine Farmer.
New England Farmer.
Massachusetts Ploughman.
American Cultivator.
New England Homestead. (Eastern Edition of American Agriculturist.)
Rural New-Yorker.
Farm Journal.
California Cultivator and Poultry Keeper.
National Stockman and Farmer.
Germantown Telegraph.
Maryland Farmer.
Prairie Farmer.

PERIODICALS RECEIVED IN EXCHANGE, *continued.*

The Industrialist.
Irrigation Age.
Garden and Field (Adelaide, South Australia).
Park and Cemetery.
Boston Daily Advertiser.
Boston Morning Journal.
Boston Daily Globe.
Boston Evening Transcript.
Boston Daily Evening Traveler.
Boston Times.

BOOKS, Etc., WANTED

BY THE

MASSACHUSETTS HORTICULTURAL SOCIETY.

☞ *Persons having any of the books in the following list to dispose of will oblige by addressing the "Librarian of the Massachusetts Horticultural Society, Horticultural Hall, 101 Tremont St., Boston."*

Album de Pomologie, Vol. 2.

Amateur World of Horticulture. Title-page and Index to Vol. II.

American Agricultural Annual. Nos. 1 and 2, 1867 and 1868.

American Agricultural Association Review and Journal, January, 1882.

American Agriculturist. 4to. Vols. 11–15 inclusive. Vol. 23, No. 7.

American Cemetery Superintendents, Association of. Proceedings of 8th Annual Convention, 1894.

American Farmer. Fifth series. Vol. 3, Nos. 7–12, January to June, 1862, and the succeeding volumes to 1873, inclusive, also the numbers for October and December, 1877, and April to December, inclusive, 1878.

American Forestry Association. (a) Proceedings of the special meeting at Washington, D. C., May, 1884, and 3rd Annual Meeting at Saratoga, N. Y., September, 1884. (b) Proceedings of 6th Annual Meeting held in Springfield, Ill., — final report, not "preliminary newspaper report." (c) Proceedings of the 8th Annual Meeting held at Philadelphia, October, 1889.

American Institute. Reports previous to 1843; 1844 and 1845, and all later than 1871–72.

American Journal of Science. (Silliman's Journal.) Vols. 11–16, 1st series.

Asa Gray Bulletin. No. 1, April (?) 1893.

Asociacion Rural del Uruguay — Revista. Vols. 1–11, and Vol. 12 (except No. 15).

Association pour la Protection des Plantes, Bulletin de l'. Nos. 1–8. 1883–1890. Genève.

Bolton's Filices Britannicæ. Part 2. 4to. Huddersfield: 1790.

Bon Jardinier, Le. 1831 to 1835 inclusive, 1837 to 1840, 1842 to 1850, 1852 to 1855, 1858, 1859, 1861, 1873.

Boston Flower Market and New England Florist. Vol. 1, No. 2.

Boston Park Reports. City Documents, Nos. 111, 1880, and 93, 1881.

British Guiana Botanic Garden. Annual Reports. [Have only 1886.]

Brongniart, A. T. Mémoire sur la génération et le developpement de l'embryon dan les végétaux phanérogames. The text.

Brooklyn, N. Y., Park Report. 27th, for 1887.

Brown, Robert, of Campster. Horæ Sylvanæ. All but the first four signatures (pp. 1–64).

Buc'hoz. Traité historique des plantes. [Our copy has very few plates. Should be 139.]

Bulliard, P. Herbier de la France. (a.) L'histoire des plantes vénéneuses, etc., (the edition with 72 colored plates). (b.) L'histoire des plantes alimentaires. (c.) L'histoire des plantes propre au meilleur fourrage. (d.) L'histoire des plantes utiles dans les arts, etc. [Also] Dictionnaire élémentaire de botanique, (which is an introduction to the whole work).

California Agricultural Society. Reports for 1864, '65, '66, '67, '74, '76, '77, '81, '86. Also Reports previous to that for 1863 (being reports of the Society previous to its re-organization).

California Horticulturist. Vols. 7 and 8, 1877 and 1878, and Nos. 2 and 3, February and March, of Vol. 9, 1879.

California Olive Industry. 1st Report, (1891?)

California State Board of Forestry. First Biennial Report. 1885–'86.

Christie, Thomas. New Commercial Plants. No. 12.

Columbia College, Contributions from the Herbarium of.

No. 4. A List of the Plants collected by Miss Mary B. Croft, at San Diego, Texas. (Except "Additions.")

No. 12. The Genus Eleocharis, etc.

No. 23. The American Species of the Genus Anemone, etc.

No. 34. The North American Species of Lespedeza.

Cosson et Germain. Flore des environs de Paris. Atlas to edition of 1845.

Country Gentleman. Vol. 2, No. 27, July 7, 1853.

Debeaux, O. Contributions a la flore de la Chine. Fasciculus 4.

Du Breuil, A. The 2nd, 3rd, and 4th parts, (if published), of the "Cours d'Arboriculture," 6th ed.

Farm and Garden. July and subsequent numbers. New York: 1853.

Fielding, H. B., assisted by George Gardner. Sertum plantarum. All that was published of Vol. II.

Florists' Exchange. Vol. I. Vol. II, Nos. 2 and 7.

Florists' Journal, 1840–1847.

Flower Garden, The. Published by Beach and Son, Brooklyn. N. Y. July, 1874. American Garden, January, 1878, and October, 1879.

Forest Leaves. Nos. 6–9, (1888) of Vol. 1, and No. 1, (also called No. 11,) January, 1889, of Vol. II.

Fruit Garden Display'd, The, setting forth the several varieties of fruit ripe in every month of the year, etc. [We have the months of June, July, and August, and want the remaining months.]

Gardener, The. A magazine of Horticulture and Floriculture. Edited by David Thomson. Index to the volume for 1878.

Georgia Horticultural Society. Proceedings of the 4th and 7th Annual Meetings.

Grape Belt, The. Vol. 1. Nos. 5, 18, 20, and 24, 1893.

Harvard University Library. Bibliographical Contributions. No. 9 (Goodale — Floras of Different Countries). No. 25 (Farlow and Trelease — List of Works on North American Fungi).

Highland Agricultural Society, Prize Essays of the, 1st Series, 1800-1826. 6 vols.

Horticultural Times and Covent Garden Gazette. Vol. 1, No. 1 and title-page and index: Vol. 2. title-page and index; Vol. 12, No. 311 and title-page and index: Vol. 14. title-page and index; Vol. 15, title-page and index: Vol. 16 title-page and index; Vol. 17, title-page and index, and all later than Vol. 17. No. 404.

Illinois Entomological Reports; First, by B. D. Walsh, for 1867.

Illinois Horticultural Society. Transactions of 1st to 4th Annual Meetings.

Indiana Horticultural Society. Transactions at the first eight sessions, previous to 1870, except the 3d, 5th, 6th, and 9th for 1864, 1866, 1867, and 1870.

Industrialist. Vols. 1–14. and Nos. 1–17 of Vol 15.

Iowa Forestry Annual.— all but No. 5, 1879.

Iowa State Horticultural Society. Reports previous to 1867; also 1868, 1869, 1871, and 1874.

Irrigation Age. Vols. 1–4, inclusive; Vol. 5, Nos. 2–5 and 8, June–September and December, 1893; Vol. 9, No. 5, May, 1896; Vol. 11, Nos. 4–9, April–September, 1897.

Japanese Horticultural Society. Journal. Nos. 1, 2, 5–8, 43–51, 57, 68, 76, 79, 85, and all later than No. 87, November, 1898.

Jaume Saint-Hilaire, J. H. Plantes de la France. Vols. 5–10.

Kansas State Board of Agriculture. 1st, 2d, and 3d Annual Reports, for 1872 (?), 1873 (?), and 1874 (?), and 2d, 3d, 4th, and 8th Biennial Reports, for 1879–80, 1881–82, 1883–84, and 1891–92.

Kirwan, C. de. Les Conifères indigènes et exotiques, etc. Tome I.

La Marck's Tableau encyclopédique et méthodique des trois règnes de la nature. Botanique. 3 vols. and Supp. (text), and plates 901–1,000.

L'Heritier, C. L. Stirpes Novæ. Fasc. 5 and 6, pp. 103–184, plates 49–84.

Lincoln Park (Chicago). Reports for 1881–2 to 1885–6. Also all previous to 1879–80.

Louisiana State Agricultural Society. Proceedings of 1st to 4th, and 11th Annual Sessions (1887–90) and 1897.

Luxembourg, Société botanique du Grand-Duché de, Recueil des Mémoires et des Travaux publiés par la. Nos. 1–10, [1867 to 1884?]

Macfadyen, J. Flora of Jamaica. Vol. II. (Only Rosaceæ to Araliaceæ were published).

Maryland Farmer. Vol. XII, No. 3, March, 1875.

Scientific Roll, The. London: 1880–1883, all beyond No. 11.

Seine Inférieure, Bulletin de la Société centrale d'Horticulture du Département de la. (*Formerly* Société d'Horticulture de Rouen). Tome 5 (1853–1856), cahier 4; Tome 7 (1860), cahier 1; Tome 14 (1870–1872), cahier 2 of 1872; title-pages to Vols. 1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13 and 14; tables of Contents to Vols 6 and 7. [Also] Tome 1 de la Pomologie, cahiers 2, 3 (being respectively cahiers 3 and 6 of Vol. 2 of Bul. Soc. cent. d'Hort.) and 6; Tome 2, cahiers 3 and 4, and title-page and table of contents.

Semi-Tropic California. Vols. 1 and 2, 1878 and 1879, and January, 1881, and March, 1882.

Smithsonian Institution. Annual Reports of the Board of Regents. 1st (1846), 2d (1847), 3d (1848), 5th (1850), 6th (1851), 7th (1852.)

Sociedad Rural Argentina. Anales de la. Vols. 1–15.

Southern Florist and Gardener. Nos. 6 and 12 of Vol. 1 and Nos. 5 and 6 of Vol. 2.

Sowerby's English Botany, Supplement to the 1st edition; Vol. 5, including plates 2961–2995.

Sweet, Robert. Geraniaceæ. Vol. 5.

United States Consular Reports. Index to Nos. 112–151 (inclusive).

United States Department of Agriculture. OFFICE OF THE SECRETARY OF AGRICULTURE. *Reports of Commissioner of Patents.* 1841, 1843.

Monthly Reports: 1863.—September (41 pp.) and October (20 pp.) Title-pages and indexes for 1863–4, 1865, 1866, 1867 and 1868.

Special Reports: Old Series. No. 34, on Contagious Diseases of Domesticated Animals. 391 pp. 1881.

Special Reports, unnumbered: The Department of Agriculture; Its History and Objects. By J. M. Swank. 64 pp. 1872.—Annual Report supplemental of the Commissioner of Agriculture to the President, Nov. 1877; also transmitting supplemental departmental reports 1 and 3. 1877.—Report on the Participation of the Department of Agriculture in the International Exhibition of 1876, at Philadelphia. By William Saunders. pp. 223–434. 1884.—Rules and Regulations of the United States Department of Agriculture for the suppression and extirpation of all contagious, infectious, and communicable diseases among the domestic animals of the United States, prepared by the Commissioner of Agriculture [N. J. Colman]. 7 pp. 1887.—Notice of Department of Agriculture; of its various functions. Folio sheet.—Koebele, A. Studies of parasitic and predaceous insects in New Zealand, Australia, and adjacent islands. June, 1893. 39 pp.

BUREAU OF ANIMAL INDUSTRY.—Circulars 9 and 14.

DIVISION OF BIOLOGICAL SURVEY.—All circulars later than 17.

DIVISION OF CHEMISTRY.—Bulletins 41 and 42.

DIVISION OF ENTOMOLOGY.—Circulars of 1st series, except No. 9. Circular No. 1, (2nd series).

OFFICE OF EXPERIMENT STATIONS.—Circulars 1–11, 13–17, 19–22, 26 and 29.

DUPLICATE BOOKS FOR SALE.

The Massachusetts Horticultural Society has for sale many duplicate books, among which are:

Alphand, A. Les Promenades de Paris. Vol. I, text, and Vol. II, plates, large paper ($25 \times 17\frac{1}{2}$ inches) copy. Paris: 1867–1873.

Country Gentleman. Vols. 1–32, large 4to. Albany, N. Y.: 1853–1868.

American Agriculturist. Vols. 1–10, 8vo. New York: 1842–1851; and Vols. 16–53, large 4to. 1857–1894.

Horticulturist. Vols. 9–17, imp. 8vo., edition with colored plates. Rochester and New York: 1854–1862.

Aublet, M. Fusée. Histoire des Plantes de la Guiane Françoise. 4 vols., 4to. Paris: 1775.

Edwards's Botanical Register, New Series. Edited by John Lindley. Vols. 1–10, large 8vo. 750 colored plates. London: 1838–1847.

Persons desiring any of the above will please address "Librarian Massachusetts Horticultural Society, No. 101 Tremont St., Boston."

Division of Forestry.— Annual Report of the Chief for 1894.

Circulars 1, 2, 4, 6, 7.

Letter from the agent of the Forestry Division, requesting information as to the extent of the lumber and wood trade. July, 1883. Folio sheet.

Circular issued for information of railroad managers. 1887. 4 pp., large 8vo.

Statement of B. E. Fernow, Chief of Forestry Division, to the Committee on Agriculture, House of Representatives, Feb. 16, 1895. 4 pp.

Instructions for the collection of test pieces of pines for timber investigations. n. d. 4 pp.

Division of Microscopy.— Special report: Naphthaline as an insecticide, etc., its effect on seeds, plants, and animals. 1883. 6 pp.

Division of Ornithology and Mammalogy.— Circulars 1–16. North American Fauna, Nos. 6, 7, and 9.

Office of Road Inquiry.— Circulars 1–12 inclusive.

Silk Section.— Bulletin No. 1. How to raise silk worms. 16 pp., x figs. February, 1890.

Division of Statistics.— The arid lands. 7 pp. September, 1889.

Division of Vegetable Physiology and Pathology.— Circulars 1, 2, 3, 13, and 14.

Weather Bureau.— Report of the Chief of the Weather Bureau, 1895-96. 4to. pp. 266.

Bulletin 11, Part III; Bulletin 15, Protection from Lightning, by A. McAdie. June, 1885. 26 pp. xiii figs.

Monthly Weather Review. Vols. I–XIX and Vol. XX, Nos. 2, 5, and 6.

United States Department of State. Consular Report on The Licorice Plant, 1885.

United States War Department. Signal Service Notes. No. XXI, and all later than No. XXIII.

Victoria Department of Agriculture. Guides to Growers. Nos. 1–7.

Virginia Commissioner of Agriculture, First Annual Report.

West Chicago Park Commissioners' Reports. 1st to 5th, 8th to 17th, 19th to 22nd, and 24th.

Western New York Horticultural Society. Reports 1 to 18, 36 and 37.

West Virginia State Board of Agriculture. 1st Biennial Report, for 1891–92.

Wilson Quarterly. Official Organ of the Wilson Ornithological Chapter of the Agassiz Association. Vols. I–III, and Vol. IV, Nos. 3 and 4.

Also Bulletin No. 6 (1895?) of the Wilson Ornithological Chapter of the Agassiz Association.

Wisconsin Agricultural Society. Transactions:—Vol. 1, 1851; Vol. 4, 1854–7(?); Vol. 6, 1860; Vols. 16–20, 1877–8 to 1881–2; Vols. 24–26, 1885–6 to 1887–8.

Wisconsin Horticultural Society. Reports previous to 1864; 1869, 1870; Volume 9, between 1878 and 1879–80; Vol. 16, 1886; Vol. 21, 1892.

Worcester North Agricultural Society. Transactions. 1st to 4th (1853–'56), and for 1863, '66, '67, '69, '70, '72–'78, '80–'82, and '90.

Zuccarini, J. G. Plantarum novarum . . . . horto botanico . . . Monacensi. Fasciculus 2.

CONTENTS.

PAGE

GENERAL HORTICULTURE, ... 353, 354
Horticultural Journals, ... 354
Horticultural Societies, ... 354–356
Flowers and Ornamental Plants, ... 357–359
Floricultural Societies, ... 359, 360
Fruits, ... 360
Fruit Growers' Societies, ... 360, 361
Vegetables, ... 361
Greenhouses, Etc., ... 361
Parks, ... 361, 362
Cemeteries, ... 363
Trees, ... 363
Forestry, ... 364
Forestry Journals, ... 364
Forestry Associations, Etc., ... 364, 365
GENERAL AGRICULTURE, ... 365, 366
Tropical Agriculture, ... 366
Grasses and Forage Plants, ... 366
Agricultural Chemistry, ... 366, 367
Soils, Fertilizers, Etc., ... 368
Agricultural Journals, ... 368
Agricultural Societies, Boards, Etc., ... 368–390
Agricultural Experiment Stations, Etc., ... 390–393
NOXIOUS PLANTS, ... 393
INSECTS, ... 393, 394
PLANT DISEASES, ETC., ... 394
SPRAYING, ... 394
GENERAL BOTANY, ... 394, 395
Economic Botany, ... 395, 396
Medical Botany, ... 396
Territorial Botany, ... 396-398
Physiological Botany, ... 398
Cryptogamic Botany, ... 399, 400
Botanical Monographs, ... 400
Botanical Journals, ... 400
Botanical Societies, ... 401
Botanical Gardens, ... 401–403
NATURAL HISTORY SOCIETIES, ETC., ... 403–405
MISCELLANEOUS, ... 406, 407
PERIODICALS PURCHASED, ... 407, 408
PERIODICALS RECEIVED IN EXCHANGE, ... 408, 409
LIST OF BOOKS WANTED BY THE SOCIETY, . . . 411–418
DUPLICATE BOOKS FOR SALE, ... 419

EXPERIMENT STATION REPORTS WANTED.

The Massachusetts Horticultural Society is endeavoring to make complete its sets of the Bulletins and other publications of all the Agricultural Experiment Stations in the United States and Canada. Those named below are wanting, and any person having a spare copy will confer a favor by addressing the Librarian of the Society, Horticultural Hall, No. 101 Tremont Street, Boston.

Alabama (Ag. and Mech. College Station).—Bulletins 4–6 (1884), 7–10 and 1–4 (1885), and 5–9 (1886). 7th Annual Report, for 1894, and 9th, for 1896.

Alabama (Canebrake Station).—All Bulletins later than 18, and all Annual Reports later than the 3d, for 1890.

Arizona.—4th Annual Report, for 1893.

Arkansas.—Bulletin 1. All Annual Reports later than the 4th, for 1891, except the 8th, for 1895.

California.—Bulletins 32, 1878, and 1, 2, 3, and 50, New Series.

Colorado.—Bulletin 3.

Connecticut (New Haven Station).—Bulletins 1 to 67 inclusive. Annual Reports for 1877 to 1883, inclusive, except that for 1878.

Florida.—Annual Reports for 1891 and 1892.

Indiana (Purdue Univ. School of Ag.)—Bulletin 1. College Reports 1–14, inclusive.

Kentucky.—Bulletin 10.

Michigan.—Special Bulletins 1, 3, and 5. 6th Annual Report, for 1892–93. (Contained in Report of Michigan Board of Agriculture, 1893.)

Missouri.—Bulletins 9, 13, 15, 16, 19, 20, 25, 26, and 33 of Old Series. All Annual Reports since the 1st, for 1888, except those for 1896 and 1897.

New Jersey.—Bulletins 1, 4, 5, 15, 27, and 28.

New York (Cornell).—Annual Report, 1882–83 (Report of Agricultural Department of Cornell University).

North Carolina.—Bulletins 1 to 56, inclusive. 1st to 7th Biennial Reports. Meteorological Division, Bulletin 2 (68*b*). Special Bulletins 1 (77*a*) and 4 (82*a*). Weekly Weather Crop Bulletins 1–21, 1888; 1–24, 1889; 1–25, 1890; 2 and 4, 1891.

North Dakota.—4th Annual Report, for 1893.

Ohio.—All Bulletins of First Series, except 16, 17, 18, and 19.

Pennsylvania.—Annual Reports for 1869, 1872, 1879–80, 1881, 1882, 1883, and 1884. [All issued by the State College.] Bulletin of Information No. 1.

South Carolina.—All Bulletins of the Old Series (previous to 1888) on the work of the Experimental Farm of the South Carolina College. 3d Annual Report, for 1890, 6th for 1893, and (9th) for 1896.

Texas.—College Bulletins 1–5, 1883–1887.

Washington.—6th, 7th, and 8th Annual Reports, for 1895–96, 1896–97, and 1897–98. All Bulletins later than 27.

West Virginia.—Special Bulletin—Potash and Paying Crops, 1890.

Wyoming.—Bulletins 2 to 4, 9, and 10.

Ontario Department of Agriculture, Toronto.—Bureau of Industries.—Agricultural Returns to the Ontario Bureau of Industries, Nov., 1882 (5th), Aug., 1883 (7th), and Nov., 1887 (20th).